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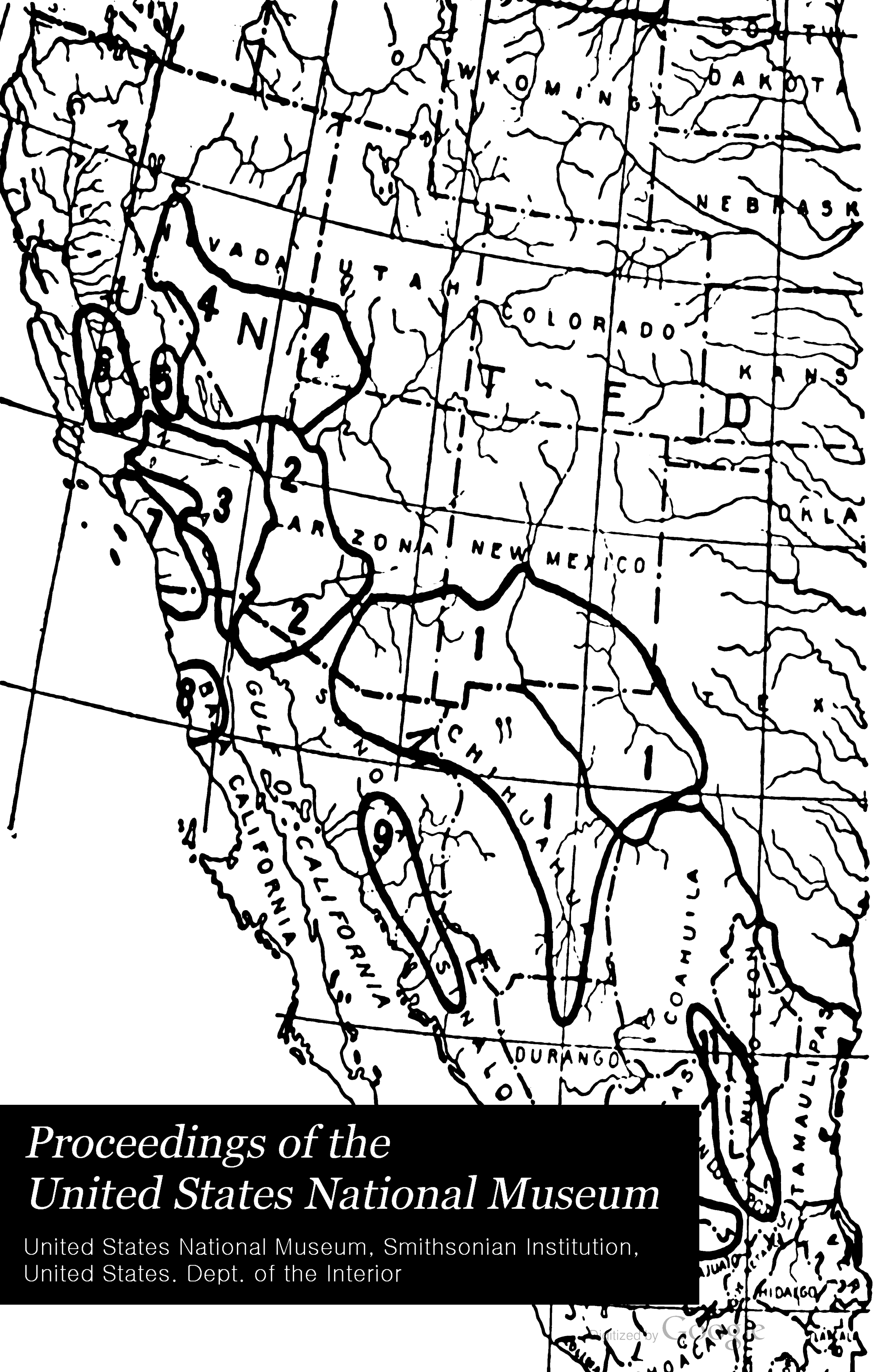

# Proceedings of the United States National Museum

United States National Museum, Smithsonian Institution, United States. Dept. of the Interior

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# PROCEEDINGS

OF THE

# UNITED STATES NATIONAL MUSEUM

## VOLUME 47

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# ADVERTISEMENT.

The scientific publications of the National Museum consist of two series—Proceedings and Bulletins.

The Proceedings, the first volume of which was issued in 1878, are intended primarily as a medium for the publication of original papers based on the collections of the National Museum, setting forth newly acquired facts in biology, anthropology, and geology derived therefrom, or containing descriptions of new forms and revisions of limited groups. A volume is issued annually or oftener for distribution to libraries and scientific establishments, and, in view of the importance of the more prompt dissemination of new facts, a limited edition of each paper is printed in pamphlet form in advance. The dates at which these separate papers are published are recorded in the table of contents of the volume.

The present volume is the forty-seventh of this series.

The Bulletin, publication of which was begun in 1875, is a series of more elaborate papers, issued separately, and, like the Proceedings, based chiefly on the collections of the National Museum.

A quarto form of the Bulletin, known as the "Special Bulletin," has been adopted in a few instances in which a larger page was deemed indispensable.

Since 1902 the volumes of the series known as "Contributions from the National Herbarium," and containing papers relation to the botanical collections of the Museum, have been published as Bulletins.

Richard Rathbun,
*Assistant Secretary, Smithsonian Institution, in charge of the United States National Museum.*

April 26, 1915.

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[1] Date of publication.

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FRIERSON, L. S. A new pearly freshwater mussel of the genus Hyria from Brazil.—No. 2053. October 29, 1914 [1]. 363

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GILBERT, CHARLES H. Two Cottoid fishes from Monterey Bay, California.—No. 2049. May 20, 1914 [1] ........... 135–137

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HARRING, HARRY K. Report on Rotatoria from Panama with descriptions of new species.—No. 2062. December 15, 1914 [1] ...................................... 525–564

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New subspecies: *Onychomys torridus surrufus.*

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# NEW GENERA AND SPECIES OF MICROLEPIDOPTERA FROM PANAMA.

By August Busck.

*Of United States Department of Agriculture.*

The following is the second installment[1] of descriptions of Microlepidoptera from Panama, based on material collected by the writer while a member of the Smithsonian Biological Survey of Panama, during two periods, from January to June, 1911, 1912.

The type material is deposited in the United States National Museum, and cotypes are, as far as possible, exchanged with the British Museum.

The citation of the type under each genus does not signify that the fixation is original in this paper, in most cases it is not; but in some as yet debatable cases the citation is necessary in order to define the author's conception of the genus in question, and the uniform citation of the genotypes will be a convenience for future students.

## Family COSMOPTERYGIDÆ.

### Genus ERITARBES Walsingham.

*Type.*—*Eritarbes otiosa* Walsingham.

### ERITARBES GUTTATA, new species.

Labial palpi straw-yellow, with terminal joint blackish toward the face. Face, head, and thorax straw-colored. Antennæ nearly as long as the forewings, straw-yellow, faintly dotted on each joint with black. Forewings shiny light straw-yellow, overlaid on exterior half with light brown; a conspicuous deep black elongate spot on the fold equidistant from apex and base of the wing; an inconspicuous dark-brown dot at the end of the fold, a few dark-brown scales at apex. Cilia straw-colored. Hindwings dark straw-colored above; underside of both wings blackish brown. Abdomen yellow. Legs whitish ochreous.

*Alar expanse.*—14 mm.

*Habitat.*—Cabima and La Chorrera, Panama, May, June.

*Type-specimen.*—Cat. No. 16668, U.S.N.M.

Reminds one in a general way of *Sitotroga cerealella* Olivier.

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[1] The first paper was published in the Smithsonian Miscellaneous Collection, vol. 59, No. 4, 1912.

## Genus PERIMEDE Chambers.

*Type.*—*Perimede errantella,* Chambers.

### PERIMEDE ANNULATA, new species.

Labial palpi blackish brown, terminal joint somewhat lighter. Antennæ dark brown with last dozen joints silvery white. Face, head, and thorax shining black. Forewings uniformly shining black with four small deep-black tufts of erect scales, one on the cell, one at the end of the cell, one on the middle of the fold, and one near the end of the fold, all encircled with whitish scales. Cilia gray. Hindwings light fuscous. Abdomen dark fuscous. Legs blackish; tarsal joints very indistinctly annulated with white.

*Alar expanse.*—11 mm.

*Habitat.*—Corozal and Paraiso, Isthmian Canal Zone, March, May.

*Type-specimen.*—Cat. No. 15814, U.S.N.M.

Very close to *Perimede particornella* Busck, but of deeper black color and distinguished by the narrow white circlets around the tufts of raised scales.

## Genus WALSHIA Clemens.

*Type.*— *Walshia amorphella* Clemens.

### WALSHIA ALBICORNELLA, new species.

Labial palpi dull ochreous, shaded with black; terminal joint nearly black with extreme apex pale. Antennæ ochreous, annulated with black and with apical fourth silvery white. Face ochreous. Head and thorax ochreous, dusted with brown and black. Forewings shiny ochreous, with black and brown ill-defined markings; from base of costa to basal fourth of dorsum runs an oblique, broad, black fascia containing two large tufts of raised scales; near the end of the cell is an oblique, transverse row of raised ochreous scales mottled with black; at tornus is an ill-defined group of black and brown scales, and along the terminal edge is a row of three black dots; apical part of the wing mottled with scattered black scales; cilia light fuscous. Hindwings dark fuscous with lighter cilia. Abdomen blackish fuscous above, underside and anal tuft ochreous. Legs ochreous with broad black bars and black tarsal annulations.

*Alar expanse.*—10–11 mm.

*Habitat.*—Paraiso and La Chorrera, Panama, February, May.

*Type-specimen.*—Cat. No. 15813, U.S.N.M.

Very close to the type of the genus and difficult to distinguish from it except by its smaller size and the white-tipped antennæ. *Walshia calcarata* Walsingham, which also has the white-tipped antennæ, differs by the white head and the clothed posterior spurs.

## Family GELECHIIDÆ

### FORTINEA, new genus.

*Type.*—*Fortinea auriciliella,* new species.

Labial palpi long, thin, recurved; second joint slightly thickened with appressed scales, compressed, slightly ruffled in front; terminal joint slender, acute, as long as second. Antennæ finely ciliate. Forewings very elongate, broadest just within tornus; costa straight until apical fourth, thence somewhat deflected to the well defined apex; termen but little oblique; dorsum straight; 11 veins; veins 10 and 11 so closely approximate and parallel as to unite throughout their length into one heavy vein, only separable into its constituents under magnification; 7 and 8 stalked; 7 to costa; 2 from near middle of cell; 3 from before the end of the cell; 4 from end of cell; 1 *b* furcate at base. Hindwings broader than forewings; costa straight; apex pointed; termen straight, oblique; dorsum straight; 8 veins; 6 and 7 stalked; cell produced at their stalk; 5 cubital, separate; 3 and 4 separate, but approximate. Posterior tibiæ hairy above.

A genus of uncertain affinity though probably related to *Catalexis* Walsingham and *Logisis* Walsingham; from both of these genera it differs in having vein 9 of the forewing free and in the unusual semi-coincidence of veins 10 and 11.

### FORTINEA AURICILIELLA, new species.

Labial palpi light ochreous brown. Face and head light straw-colored. Antennæ light straw-colored, faintly annulated with dark brown toward their tips. Thorax light brown. Forewings light ochreous brown; extreme costal edge blackish brown; below this runs a thin, light ochreous, submarginal line from base to apex, whence it turns obliquely inward straight to the middle of the fold; this thin ochreous line is edged above with dark brown and is faintly continued along the fold to the base of the wing; it gives the wing a superficial appearance of a much narrower, elachistid wing with a long cilia represented by the tornal part; along the terminal edge is a dark brown submarginal line, beyond which the wing and the cilia are strongly metallic golden; dorsal cilia not metallic, dark greenish brown. Hindwings dark brownish fuscous with golden yellow tips; apical cilia golden yellow with a deeper yellow basal line; dorsal cilia brown. Abdomen dark brown above; underside ochreous. Legs ochreous, shaded externally with dark brown.

*Alar expanse.*—24 mm.

*Habitat.*—Porto Bello, Panama, May.

*Type-specimen.*—Cat. No. 15815, U.S.N.M.

### ATOPONEURA, new genus.

*Type.—Atoponeura violacea*, new species.

Labial palpi long, recurved; second joint thickened with appressed scales, compressed, slightly rough posteriorly; terminal joint thickened with scales except at extreme tip, compressed. Antennæ three-fourths, simple. Tongue well developed, spiraled. Head and thorax smooth. Forewings elongate, narrow; costa and dorsum nearly straight and parallel; tip of the wing rounded; apex below the median line; termen rounded; 11 veins; 7 and 8 coincident; 6 to costa; 5 to apex; 2 and 3 stalked. Hindwings broader than forewings; costa deflected beyond the middle; apex blunt; termen slightly sinuated; dorsum nearly straight; flexus prominent; 8 veins; 3 and 4 connate; 5 cubital; 6 and 7 closely approximate; crossvein between 7 and 8 at basal fourth. Posterior tibiæ hairy above.

Nearest to and correlated with *Simaneura* Walsingham and like it with vein 6 in the forewing running to costa but further advanced in having 5 to apex and 3 and 4 stalked.

The form of the labial palpi also distinguishes it from this genus. Only one other American genus is known with a similar venation in the forewing, i. e., *Idiocrates* Meyrick,[1] which differs, however, in having vein 2 and 3 separate while the venation of the hindwings [6 and 7 parallel and 5 absent] proves it not at all related to the present genus.

#### ATOPONEURA VIOLACEA, new species.

Labial palpi golden metallic yellow with base and terminal joint shaded with black exteriorly. Antennæ purplish black. Head and thorax bluish black, iridescent; face a shade lighter. Forewings black, overlaid with metallic, light blue scales and with a strong purplish sheen, especially toward apex, which, as well as the cilia, in certain light appear like burnished copper. Hindwing dark fuscous. Abdomen bluish fuscous. Legs bluish gray on the inside, black exteriorly.

*Alar expanse.*—14 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 15816, U.S.N.M.

The species appears plain black and inconspicuous in dull light, but in reflected light it is a very brilliant insect.

### BELTHECA, new genus.

*Type.—Beltheca picolella*, new species.

Labial palpi long, recurved; second joint thickened with scales, which are smoothly applied on the under side, but form a short brush on the upper side; terminal joint longer than second, slender, acute.

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[1] Trans. Ent. Soc. Lond., 1909, p. 19.

Fore wings elongate, ovate, apex round pointed, termen oblique; 11 veins: 7 and 8 coincident to costa; 6 to apex; 2, 3, 4, and 5 equidistant; (7 and 8), 9, 10, and 11 equidistant; 11 from beyond middle of the cell; 1*b* furcate at base. Hind wings somewhat narrower than the forewings with costa gently arched, apex produced, termen strongly sinuate, dorsum straight; 7 veins: 6 obsolete; 7 to apex; 2, 3, 4, and 5 well separated, equidistant. Posterior tibiæ rough haired above.

A development from *Aristotelia*, correlated with *Chrysopora* Clemens, from which it differs by the coincident veins 7 and 8 of the forewings.

### BELTHECA PICOLELLA, new species.

Second joint of labial palpi whitish gray with blackish tuft; third joint black with a broad, longitudinal, silvery line and with silvery apex. Eyes in the living specimen red. Lower face silvery white; upper face and head dark iridescent brown. Thorax blackish brown. Forewing blackish brown with a thin outwardly oblique white streaklet just beyond middle of costa and with two triangular white dashes just before apex; a few scattered white scales at the end of the cell and on the fold. Cilia black; just below apex it is short so as to give the wing a slightly emarginate appearance. Hind wings blackish fuscous with a bluish cast; cilia black. Abdomen iridescent blackish fuscous with silvery white underside. Legs blackish brown with white tarsal annulations.

*Alar expanse.*—9–10 mm.

*Habitat.*—Cabima, Panama, May.

*Type-specimen.*—Cat. No. 16669, U.S.N.M.

A striking little species reminding one of the genus *Apopira* Walsingham.

### BESCIVA, new genus.

*Type.—Besciva longitudinella,* new species.

Labial palpi long, recurved, sickle-formed; second joint somewhat thickened with scales, smooth; terminal joint longer than second, pointed. Antennæ shorter than the fore wings. Fore wings narrow, elongate ovate with apex pointed; 11 veins: 7 and 8 coincident to costa; 6 separate to termen; 2, 3, 4, and 5 separate, nearly equidistant; 11 from beyond middle of cell, subobsolete toward the edge of the wing. Hind wings somewhat narrower than the fore wings with costa and dorsum nearly straight and parallel; apex produced, termen sinuated below apex; 8 veins: 6 and 7 longstalked; 6 to apex; 3 and 4 shortstalked; 5 cubital. Posterior tibiæ hairy above.

Allied to *Untomia* Busck, from which it differs in the separate veins 3 and 4 of the fore wing, the stalked veins 3 and 4 of the hind wing, and in having vein 6 of the hind wing to apex.

### BESCIVA LONGITUDINELLA, new species.

Second joint of labial palpi white, barred exteriorly with light brown; terminal joint white with two indistinct brown annulations. Antennæ light brown with white annulations. Face, head, and thorax white laterally with a light brown central streak. Fore wings with the white ground color strongly overlaid by light ochreous brown and black scales; a nearly continuous, longitudinal, undulating line runs through the middle of the wing from base to apex, bordered above with pure white; another black longitudinal line covers basal four-fifths of the fold; the rest of the wing area is ochreous brown, with the costal edge slightly dusted with black. Hind wings blackish fuscous with ochreous cilia. Abdomen blackish above, light ochreous on the under side. Legs whitish ochreous, dusted exteriorly with brown.

*Alar expanse.*—9 mm.

*Habitat.*—La Chorrera and Trinidad River, Panama, March, April.

*Type-specimen.*—Cat. No. 16670, U.S.N.M.

### GALTICA, new genus.

*Type.*—*Galtica venosa*, new species.

Labial palpi long, sickle-formed, reaching far beyond vertex; second joint slightly thickened with appressed scales; terminal joint nearly as long as second, slender, acute. Fore wings elongate ovate; apex bluntly pointed; termen rounded; 11 veins; 7 and 8 coincident; 4 and 5 shortstalked from the end of the cell; 2 and 3 widely separate from before the end of the cell; transverse vein nearly obsolete; 1*b* furcate at base. Hind wings wider than the forewings; costa nearly straight, slightly deflected beyond the middle; apex bluntly pointed; termen and dorsum rounded; 8 veins; 6 and 7 separate, though approximate; 3 and 4 connate; 5 cubital. Posterior tibiæ with heavy spreading tufts of long bristly hairs above.

This genus comes nearest to *Diadytica* Walsingham, from which it differs in having veins 4 and 5 of the fore wing shortstalked and in having 3 and 4 of the hind wings connate, not shortstalked; more strikingly distinguished in the very remarkable hair development of the posterior tibiæ; those of *Diadytica* being nearly smooth.

### GALTICA VENOSA, new species.

Labial palpi straw-yellow, with a thin, longitudinal, anterior, deep black line from base to apex, somewhat broader on the terminal joint. Face, head, and thorax purplish black, mottled with a few yellow scales. Forewings deep dull black with a broad, ill-defined, yellow band across the wing near base and with all the veins on the outer half of the wing indicated by narrow, yellow lines; an irregular aggregation of yellow scales at tornus; cilia blackish with a yellow base line. Hindwings dark fuscous. Abdomen blackish fuscous.

Legs blackish with yellow tarsi; posterior tibiæ with very striking spreading tufts of yellow and black hairs, displayed conspicuously when the insect is at rest; posterior first tarsal joints thickened with smooth, dark metallic blue scales.

*Alar expanse.*—18 mm.

*Habitat.*—Porto Bello, Panama, April.

*Type-specimen.*—Cat. No. 15817, U.S.N.M.

### Genus ANACAMPSIS Curtis.

*Type.*—*Anacampsis populella* Clerck.

#### ANACAMPSIS PECULELLA, new species.

Labial palpi silvery gray, shaded with darker gray, especially anteriorly on the terminal joint. Antennæ dark brown with narrow silvery annulations. Tongue silvery white. Head and thorax dark brownish fuscous; face somewhat lighter. Ground color of the forewings is white but so strongly and evenly overlaid with dark brown scales as to be obscured, except under magnification; near the base is a broad, outwardly oblique, dark brown costal streak, reaching beyond the fold; on the middle of costa is a large, triangular spot, reaching to the lower edge of the cell; at the end of the cell is a small, moon-shaped, dark brown spot; just before termen and parallel with it is a broad, dark brown fascia, and between it and the discal spot is a narrower, less pronounced and slightly convex, dark brown fascia; cilia dark brown with lighter tips. Hindwings dark brownish fuscous. Abdomen dark brown above with each joint tipped with silvery white. Underside of body silvery white. Legs silvery white, barred and annulated with dark brown.

*Alar expanse.*—11–12 mm.

*Habitat.*—Paraiso, Porto Bello, Trinidad River, and La Chorrera, Panama, February–May.

*Type-specimen.*—Cat. No. 15818, U.S.N.M.

This species is very close to *Anacampsis siderophaea* Walsingham, but differs in the darker and more pronounced wing ornamentation and the lighter legs and body. *A. siderophaea* Walsingham has the abdomen uniformly dark brown above, without the silvery white crosslines possessed by the present species.

#### ANACAMPSIS LAGUNCULARIELLA Busck.

*Anacampsis laguncularilla* Busck, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 230; vol. 25, 1902, p. 848; Bull. 52, U. S. Nat. Mus., 1903, No. 5706.

*Anacampsis laguncularilla* Dyar, Proc. Ent. Soc. Wash., vol. 10, 1901, p. 474.

This species, hitherto known only from the bred type series from Palm Beach, Florida, was taken in several specimens at Corozal and La Chorrera, Panama, April–May.

*Foodplant.*—*Laguncularia racemosa.*

### ANACAMPSIS DORSALIS, new species.

Second joint of labial palpi and base of third black, iridescent; upper four-fifths of terminal joint white. Antennæ black, with basal fourth and extreme tip white. Face smoky; head and thorax whitish ochreous. Forewing whitish ochreous with a large, blackish brown, oval, dorsal spot, occupying more than a third of the wing space, beginning near the base and reaching to apical third of the dorsal edge and beyond the middle of the wing; apical part of the wing largely occupied by a strongly iridescent pearly area before and after which the wing is shaded with brown; apical third of costa blackish brown with a short, oblique, ochreous streak before a triangular apical spot; three short, black, longitudinal streaks on the terminal edge; cilia white with a brown line parallel to the wing edge. Hindwing dark fuscous with whitish costal edge. Abdomen dark fuscous with ochreous anal tuft and a series of lateral ochreous spots. Legs light ochreous with broad black bars on tibiæ and tarsi.

*Alar expanse.*—13–14 mm.

*Habitat.*—Trinidad River, Porto Bello, and La Chorrera, Panama, April, May, and June.

*Type-specimen.*—Cat. No. 15819, U.S.N.M.

I have tried to identify this species with *fuliginosa* Felder and Rogenhofer, which, according to the figure, is very similar, but deem it safer to keep it under a separate name.

### ANACAMPSIS PHYTOMIELLA, new species.

Second joint of labial palpi blackish green on the outer surface, whitish at apex and on the inner side; terminal joint with basal half white, except for a broad, dark green annulation and with outer half golden brown; extreme tip black. Head and thorax dark olive green; face a shade lighter green. Forewing dark green, mottled with light ocherous and blackish brown scales; on the middle of the costal edge is a black spot and at apical third is a similar spot; from both of these run faint, irregular, darker green, zigzag fasciæ across the wing outwardly narrowly edged with ocherous; scattered irregularly over the wing are small tufts of blackish brown, raised scales and around apical and terminal edge is a subterminal row of black dots. Hindwings dark blackish brown; darkest and nearly black towards the tip; costal edge above vein 8 silvery white. Abdomen blackish brown above, greenish fuscous below. Legs greenish brown with narrow, white annulations on the tarsal joints.

*Alar expanse.*—18–19 mm.

*Habitat.*—Alhajuela, Cabima, and Porto Bello, Panama, March–June.

*Type-specimen.*—Cat. No. 15820, U.S.N.M.

A very good example of protective coloration. All of the thirty-odd specimens were taken on mossy tree trunks in the deep forest and their colors blended so well with those of the bark, that even when I saw them alight and after they had been disturbed by a puff of tobacco smoke, I would again and again lose sight of these quite large specimens. On one large tree trunk near Alhajuela, where the majority of the specimens were taken, many hundred were quietly sitting and could not be detected except by making them fly up, though I knew they were there.

### ANACAMPSIS BISTRIGELLA, new species.

Second joint of labial palpi black exteriorly with apical edge white; inner side of second joint and the terminal joint whitish ocherous with a black dot just before the tip. Antennæ ochreous with dark brown annulations. Face, head, and thorax light ochreous fuscous. Forewings light ochreous fuscous with white and blackish brown markings; costal edge with three blackish markings, one from base to basal fourth with a smaller projection obliquely outward, one an obliquely outwardly directed streak on the middle and the third a large spot covering apical third of the costal edge but interrupted by a thin, white, transverse, outwardly angulated fascia across the wing at apical fourth and by two, small, perpendicular streaks beyond this fascia; at the angle of the fascia is a narrow, longitudinal, black streak; apical edge with a marginal, black streak; cell and dorsal part of the wing mottled with several, irregular, small, blackish brown spots. Hindwings dark fuscous. Abdomen dark fuscous with light ochreous underside. Legs fuscous; tarsi blackish brown with the tips of the joints ochreous.

*Alar expanse.*—8–9 mm.

*Habitat.*—Alhajuela and Cabima, Panama, April, May.

*Type-specimen.*—Cat. No. 15822, U.S.N.M.

It reminds one in coloration and pattern of the North American *Aproærema nigratomella* Clemens.

### ANACAMPSIS UNISTRIGELLA, new species.

Very similar to the foregoing species though somewhat darker and more greenish in color. The costal spots are nearly contiguous; the first one smaller than in *bistrigella;* the second and third separated only by a thin, white streak; there is only one white streaklet on the costal margin beyond the fascia and the longitudinal, black streak at the angle of the fascia is surrounded by white scales contiguous with the fascia; at the end of the cell are two, elongate, black streaks and the cell and dorsal part are not mottled.

*Alar expanse.*—8 mm.

*Habitat.*—Taboga Island, Panama, June.

*Type-specimen.*—Cat. No. 15821, U.S.N.M.

### ANACAMPSIS CURTELLA, new species.

Second joint of labial palpi light gray with blackish apex; terminal joint white with a broad, black band just below the tip. Face whitish gray. Head and thorax dark gray. Forewings dark gray, finely irrorated with minute greenish ochreous dusting; outer half of costal edge with an oblique, white streaklet at apical third and a perpendicular, white streaklet just before apex; this latter nearly connects with a thin, perpendicular, white line across the wing, outside of which the tip of the wing is light gray with a single black longitudinal dash and a broad black marginal line narrowly edged with yellow. Hindwings dark brownish fuscous with basal half of costa silvery white. Abdomen dark fuscous above, silvery on the underside. Legs silvery gray; the tarsi blackish with narrow ochreous annulations.

*Alar expanse.*—10, 11 mm.

*Habitat.*—Trinidad River, Panama, June.

*Type-specimen.*—Cat. No. 15823, U.S.N.M.

Closely allied to the two foregoing species, but larger and darker than either.

### ANACAMPSIS TERRENELLA, new species.

Labial palpi dark fuscous; both joints with an anterior, thin, white line from base to apex, bordered on both sides with black. Face iridescent ochreous fuscous. Head and anterior part of thorax and base of the patagina blackish brown; posterior two-thirds of thorax and patagina light reddish brown. Forewings of a light reddish brown color with a violet sheen and sparsely dusted with black atoms; extreme base of costa, a small spot on the middle of costa, and another at apical third black; two ill-defined small black dots on the middle of the cell and a similar one at the end of the cell; entire tip and terminal cilia black; dorsal cilia ochreous. Hindwings broader than the forewings, dark fuscous, shiny; cilia a shade lighter. Abdomen dark fuscous with underside and anal tuft ochreous. Legs ochreous shaded with black.

*Alar expanse.*—16 mm.

*Habitat.*—Porto Bello, Panama, May.

*Type-specimen.*—Cat. No. 16671, U.S.N.M.

## Genus PARASPISTIS Meyrick.

*Type.*—*Paraspistis palpigera* Walsingham.

### PARASPISTIS PALPIGERA Walsingham.

*Gelechia palpigera* Walsingham, Trans. Ent. Soc. Lond., 1891, p. 94, pl. 4, fig. 31.
*Paraspistis iolencha* Meyrick, Journ. Bombay Nat. Hist. Soc., vol. 16, 1905, p. 600.
*Lipatia crotolariella* Busck, Bull. Dep. Agr. Trinidad, vol. 9, 1910, p. 243.

Labial palpi light brown with second joint blackish exteriorly. Antennæ light brown, annulated with white. Face, head, and thorax light brown. Forewings light ochreous brown, with a deeper tinge outwardly and with costal edge becoming broadly dark brown toward the apex; on the middle of the wing, on the middle of the fold, and at tornus are small aggregations of blackish scales, ill-defined and easily rubbed off. Hindwings blackish fuscous. Abdomen dark fuscous with the basal joints velvety ochreous above. Legs ochreous, sprinkled with black exteriorly; tarsi blackish with narrow ochreous annulations.

*Alar expanse.*—13—14 mm.

*Habitat.*—British West Indies, F. W. Urich, coll.

*Food-plant.*—*Crotolaria.*

*Type-specimen.*—Cat. No. 13382, U.S.N.M. Cotype in British Museum.

Bred by Mr. Urich from the pods of *Crotolaria.* There has been for many years a specimen of this species in the United States National Museum, bred by Dr. H. G. Dyar from pods of "woman's tongue," *Acacia?* sp. at Nassau, Providence Island, British West Indies, in 1891, which indicates a quite extensive range of the species.

While collating Mr. Meyrick's descriptions of East Indian genera with my synoptic tables I recognized in his *Paraspistis ioloncha*, described from four Ceylon specimens my *Lipatia crotolariella,* described from Trinidad, and sent Mr. Meyrick a specimen of the latter for verification. Mr. Meyrick concurred in this synonymy and was good enough to give me the further synonomy of *Gelechia palpigera* Walsingham, described from East Africa.

This interesting species, previously also recorded by the author from the Bahamas, was taken at Alhajuela and Corozal, Panama, April, 1911.

It breeds in the pods of *Crotolaria* and has attained its remarkable geographic distribution with its food-plant.

## Genus RECURVARIA Haworth.

*Type.*—*Recurvaria nanella* Hübner.

### RECURVARIA PUTELLA, new species.

Labial palpi whitish; second joint with two, large, poorly defined, ochreous brown blotches anteriorly, one reaching from base to beyond middle, the other just before the end of the joint; terminal joint white, with two black annulations; apex white. Face white; head mottled with ochreous. Antennæ white sharply annulated with blackish brown. Thorax white, mottled with ochreous and brown. Forewings with the white ground color, strongly suffused with gray, brown, ochreous, and black scales; a large blackish brown, dorsal blotch at the base of the wing terminates in tufts of raised scales, the tips of which are white; three equidistant, blackish, costal spots, one near the base, one before the middle, and one at apical third; a central, longitudinal, black streak is edged on both sides with ochreous and is interrupted at apical fourth by a transverse streak of tufted whitish scales; cilia gray. Hindwings dark gray with cilia a shade lighter. Abdomen silvery white, shaded laterally with fuscous. Legs white; tarsal joints with black annulations.

*Alar expanse.*—7 mm.

*Habitat.*—Paraiso, Isthmian Canal Zone. La Chorrera, Panama, May, April.

*Type-specimen.*—Cat. No. 15824, U.S.N.M.

Reminding in a general way of *Recurvaria sticta* Walsingham, but is smaller and with more mottled wing ornamentation.

### RECURVARIA FLAVIDELLA, new species.

Labial palpi ochreous; second joint with rather larger tuft than is normal in the genus; terminal joint with two deep black annulations. Antennæ ochreous with black annulations. Face silvery white. Head light ochreous. Thorax darker ochreous. Forewings light ochreous, suffused on costal and apical half with darker ochreous; on the middle of the cell is a small black dot and below it on the fold is a tuft of raised scales; at the end of the cell are two, small, black dots, one above the other, below which a tuft of raised scales, narrowly edged with black; on the middle of costa is an inconspicuous, outwardly oblique, black streaklet; at apical fourth is a similar, but much more pronounced black streak, reaching nearly to termen and edged posteriorly with light ochreous; around the apical edge is a series of short black lines. Cilia dark ochreous with lighter tips. Hindwings light ochreous fuscous with light ochreous cilia. Abdomen light ochreous above, silvery below. Legs ochreous; tarsal joints annulated with black.

*Alar expanse.*—7 mm.

*Habitat.*—Paraiso, Isthmian Canal Zone. April, May.

*Type-specimen.*—Cat. No. 15825, U.S.N.M.

This species is very close to *R. apicitripunctella* Clemens, and *R. variella* Chambers, smaller than either and differing, aside from details of ornamentation, in the more tufted palpi.

## Genus GELECHIA Hübner.

*Type*—*Gelechia rhombella* Hübner.

### GELECHIA TRADUCELLA, new species.

Labial palpi with second joint nearly smooth and terminal joint fully as long as second; black, minutely sprinkled with white scales, which on the terminal joint form an indistinct, longitudinal, anterior line. Lower part of face black; upper part and head light ochreous. Antennæ black with short, longitudinal, silvery white streaks. Thorax black. Forewings black with a light yellow, oblique fascia from basal fourth of costa to basal third of dorsum and with a spot of the same color on apical fourth of costa; upper part of cilia black, lower part yellow. Hindwings blackish fuscuous. Abdomen blackish fuscous above, underside ochreous. Legs black with a broad, yellow band at the end of the posterior tibiæ and with narrow, yellow tarsal annulations.

*Alar expanse.*—12 mm.

*Habitat.*—La Chorrera, Panama, May.

*Type-specimen.*—Cat. No. 15826, U.S.N.M.

Reminds in a general way of *Arogalea sonorella* Busck, which was collected at light at the same time as the present species. It is easily distinguished by the complete yellow fascia on the forewings.

### GELECHIA GENIATELLA, new species.

Labial palpi with well developed triangular tuft, white with a blackish bar on the middle and an ochreous pencil in the tuft; terminal joint fully as long as second, white sparsely sprinkled with brown. Face white, iridescent. Head mottled with gray. Thorax white mottled with gray and ochreous. Forewings white overlaid with dark gray and ochreous scales; on the middle of the cell are two large tufts of dark erect scales, one above the other and together reaching nearly across the wing; the bases of these tufts are yellow; on the costa are four dark brown spots edged below with yellow; at tornus is a fugitive ring of dark brown scales with a few yellow scales within; apical part of the wing is heavily overlaid with dark brown which obscures a row of dark terminal dots. Hindwings semitransparent on basal half; dark fuscous on apical half; the males have a strong costal tuft, ochreous at base, blackish brown at tips; veins 6 and 7 are long stalked; veins 3 and 4 short stalked. Abdomen dark silvery fuscous above, whitish on the underside. Legs whitish ochreous, sprinkled with black and with black tarsal annulations.

*Alar expanse.*—11–12 mm.

*Habitat.*—Porto Bello, Trinidad River, Alhajuela, Paraiso and Corozal, Panama, March–May.

*Type-specimen.*—Cat. No. 15827, U.S.N.M.

A rather extreme form with its *Ypsolophus*-like tuft, its long-stalked veins 6 and 7, its strongly tufted forewings and with the male costal hair pencil, which is rather exceptional in the genus, but withal properly included in *Gelechia*.

### AROGA, new genus.

*Type.*—*Gelechia paraplutella* Busck.[1]

Labial palpi long, recurved; second joint thickened with rough, slightly furrowed brush on the underside; terminal joint long, slender, acute, shorter than the second. Forewings elongate, smooth; costa and dorsum nearly straight and parallel until apical fourth;

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[1] Proc. Ent. Soc. Wash., vol. 11, 1909, p. 181.

apex pointed; termen oblique; 12 veins; 7 and 8 stalked; 2, 3, 4, and 5 separate, nearly equidistant; 2 and 3 from before the corner of the cell; 1*b* furcate at base. Hindwings as broad or broader than the forewings; apex somewhat produced; termen sinuate; 8 veins; 3 and 4 separate but approximate; 5 cubital; 6 and 7 separate. Posterior tibiæ hairy above.

A genus for the reception of species immediate between *Gelechia* Authores and *Telphusa* Chambers, differing from the former in having 3 and 4 of the hindwings separate, not connate, and from the latter in having veins 6 and 7 in the hindwings separate, not stalked. The genus, *Arogalea* Walsingham[1] conforms to these demands, but differs from the present genus in the approximation of veins 3, 4, and 5 from the end of the cell in the forewings and by the raised scales of the forewings as well as in the form of the labial palpi. *Parastega* Meyrick[2] differs from the present genus in the form of the palpi and in having veins 3 and 4 of the forewings stalked.

### AROGA PARAPLUTELLA Busck.

*Gelechia paraplutella* Busck, Proc. Ent. Soc. Wash., vol. 11, 1909, p. 181.

Labial palpi creamy white; extreme base of second joint and the terminal joint sprinkled with black scales; brush well-developed, furrowed. Antennæ deep black. Face and head creamy white. Thorax light clay-yellow; patagina black. Forewings blackish fuscous with entire dorsal part below the fold light reddish yellow; in faded specimens this color becomes yellowish white. Hindwings light fuscous. Abdomen dark fuscous with light anal tuft. Legs ochreous on their inner sides, heavily barred with black externally; tarsi with broad black annulations.

*Alar expanse.*—11–12 mm.

*Habitat.*—San Diego, California, May and July. L. E. Ricksecker, coll.; Los Angeles, California, June, Dyar and Caudell, coll.

*Type-specimen.*—Cat. No. 12688, U.S.N.M.

A single rubbed specimen from Paraiso, Panama, January, is with some doubt referred to this species.

## Genus PSORICOPTERA Stainton.

*Type.*—*Psoricoptera gibbosella* Zeller.

### PSORICOPTERA HORA, new species.

Labial palpi ochreous; terminal joint and outer side of second joint shaded with black. Antennæ light ochreous, annulated with dark brown. Face light golden ochreous. Head and thorax darker ochreous, mottled with dark brown. Forewings light ochreous, shaded and longitudinally streaked with blackish brown; a large, dark, brown spot reaches from the middle of costa to apical fifth and is followed by a small, unmottled, ochreous space; on the middle of the fold is a black streak; extreme tip of the wing blackish; cilia ochreous with a basal and a terminal black line. Hindwings light fuscous with edges and cilia a shade darker. Abdomen dirty ochreous. Legs ochreous, barred with dark brown; tarsi annulated with black.

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[1] Biol. Cent.-Amer., vol. 4, 1910, p. 98.

[2] Trans. Ent. Soc. Lond., 1912, p. 698.

*Alar expanse.*—12 mm.

*Habitat.*—Alhajuela, Panama, April.

*Type-specimen.*—Cat. No. 15828, U.S.N.M.

An inconspicuous species reminding of *Phthorimaea striatella* Murtfeldt.

## Genus TELPHUSA Chambers.

*Type.*—*Telphusa longifasciella* Clemens.

### TELPHUSA OBLIGATA, new species.

Second joint of the labial palpi black with white apex; terminal joint white. Face silvery ochreous. Antennæ light ochreous with narrow black annulations. Head and thorax light reddish ochreous. Forewings light ochreous with a strong rosy tint, especially on costal and apical part; and sparsely sprinkled with minute black atoms; at basal third of costa is a large, deep black, outwardly oblique spot, reaching beyond the fold; at apical third is a deep black costal spot; a series of small terminal dots black; base of dorsum and a small dot on the middle of the wing near base black; cilia reddish ochreous. Hindwings light fuscous. Abdomen fuscous with the posterior edge of each joint and with anal tuft ochreous. Legs ochreous; tarsal joints barred with black.

*Alar expanse.*—11 mm.

*Habitat.*—La Chorrera, Panama, May.

*Type-specimen.*—Cat. No. 15829, U.S.N.M.

A pretty species with a bold, easily recognized wing ornamentation.

### TELPHUSA MEDULELLA, new species.

Labial palpi ochreous, mottled with black; terminal joints mostly black, but with base and extreme apex ochreous. Antennæ black with first joint and apical joints tipped with yellow. Face and head ochreous, slightly tipped with black. Thorax blackish brown on anterior half, ochreous posteriorly; patagina brown. Forewings ochreous and dark brown in about equal proportion; taking the brown as ground-color, there is an ill-defined ochreous band from near the base of costa to the middle of dorsum and thence upward again across the outer part of the cell to apical third of costa; this uneven band is loosely connected with an ochreous spot on apical fourth of costa by a downwardly curved narrow band and also with a yellow spot at base of dorsum, the whole forming a very irregular zigzag band of more or less raised scales on the smooth dark background; at the end of the cell are two deep black dots and on the middle of the fold is a similar, smaller, black dot; cilia dark fuscous. Hindwings light fuscous; cilia with ochreous base. Abdomen fuscous mottled with ochreous and with ochreous anal tuft. Legs blackish brown with the ends of the joints annulated with yellow.

*Alar expanse.*—9 mm.

*Habitat.*—Porto Bello and Trinidad River, Panama, March, April, and May.

*Type-specimen.*—Cat. No. 15830, U.S.N.M.

## Genus PARASTEGA Meyrick.

*Type.*—*Parastega niveisignella* Zeller.

### PARASTEGA CURVATELLA, new species.

Labial palpi blackish brown, slightly sprinkled with white and with extreme apex white. Face, head, and thorax blackish brown. Forewings blackish brown with a purple sheen; from basal fifth of costa runs a narrow white streak obliquely outwards and downwards to the fold and is continued much attenuated and obscurely beyond the fold outwardly in a shallow curve; on the fold is an interrupted, light brown, longitudinal streak; at apical fifth is a small white costal spot; cilia blackish brown. Hindwings dark fuscous. Abdomen blackish brown with small ochreous anal tuft. Legs blackish brown with narrow white annulations at the end of the joints.

*Alar expanse.*—12–14 mm.

*Habitat.*—Porto Bello, Trinidad River, and La Chorrera, Panama, March–May.

*Type-specimen.*—Cat. No. 15731, U.S.N.M.

Close to and easily mistakable for the type of the genus, *P. niveisignella* Zeller, but differing in the much narrower and longer basal costal spot and the smaller apical, costal, white spot. *P. chionostigma* Walsingham, described as *Telphusa*, must also be referred to this genus; it is easily separated by its white head and bold, clear-cut wing markings.

### PARASTEGA TRICHELLA, new species.

Labial palpi black; second joint with brush rust brown; terminal joint with an anterior line of white dots and with extreme apex white. Antennæ purplish black. Face, head, and thorax purplish black. Forewings blackish brown with strong purple sheen; at basal fourth is a narrow, outwardly oblique, straight, silvery white streak; at apical fourth is a small triangular outwardly pointed white costal streak; cilia bluish dotted with dark brown. Hindwings dark fuscous. Abdomen blackish brown. Legs black with narrow white annulations at the end of the joints.

*Alar expanse.*—11 mm.

*Habitat.*—Porto Bello and Trinidad River, Panama, April, May.

*Type-specimen.*—Cat. No. 15832, U.S.N.M.

Very close to the foregoing species, *curvatella* Busck, but smaller, more shiny, with less white ornamentations and without the brown streak on the fold. The reddish brown palpal brush at once separates this species.

## Genus AROGALEA Walsingham.

*Type.*—*Arogalea cristifasciella* Chambers.

### AROGALEA SORONELLA, new species.

Second joint of labial palpi white above and at apex with black underside; terminal joint black, with extreme tip white. Face and head whitish yellow. Antennæ black. Thorax black with two, small, yellow, posterior tufts of raised scales. Forewings deep black with light yellow markings; an oblique yellow spot on basal fourth of costa; a yellow spot on apical fourth of costa; a small yellow tuft of raised scales on the middle of the fold; black scale tufts at basal fourth and at the end of the cell, the latter with a few yellow scales; a minute yellow dot at tornus; cilia black. Hindwings blackish fuscous. Abdomen black with yellow anal tuft. Legs black; tarsal joints annulated with yellow.

*Alar expanse.*—12–13 mm.

*Habitat.*—La Chorrera and Cabima, Panama, May.

*Type-specimen.*—Cat. No. 15833, U.S.N.M.

Reminds in coloration and pattern very much of the somewhat larger *Parastega chionostigma* Walsingham, from which it is, however, at once distinguished by the yellow dots on the thorax and the differently colored labial palpi.

## Genus DICHOMERIS Hübner.

*Type.*—*Dichomeris ligulella* Hübner.

### DICHOMERIS TRISTICTA, new species.

Second joint of labial palpi with well-developed brush (*Malacotriche* type), light brown on the inner side; blackish brown exteriorly, with tip of the brush white; terminal joint light brown. Antennæ light ochreous brown with narrow black annulations. Face, head and thorax light ochreous brown; extreme posterior tip of thorax black. Forewings light ochreous brown with a round black dot on the middle of the cell, another at the end of the cell and a similar one on the fold, all slightly edged with reddish brown; base of costal edge black; around the apical edge is a series of small black dots. Hindwings dark brownish fuscous. Abdomen ochreous brown. Legs ochreous on the inner sides, blackish exteriorly.

*Alar expanse.*—14 mm.

*Habitat.*—Trinidad River, Panama, May.

*Type-specimen.*—Cat. No. 16672, U.S.N.M.

Nearest and very similar to *D. hexasticta* Walsingham, but differing in the number of discal dots and in the much darker hindwings.

### DICHOMERIS COSTALIS, new species.

Second joint of labial palpi with strong rounded tuft above and beneath; ochreous at base, brush blackish, minutely dotted with white; terminal joint blackish brown with silvery base. Lower face golden ochreous; upper face and head colored like the palpal tuft. Thorax dark brown; patagina light ochreous brown with a palpal sheen. Entire costal part of the wing light ochreous brown with a violet sheen; this color is edged by a deep velvety black, longitudinal streak from the inner angle of the wing to apex; this black color gradually fades into the dark blackish fuscous color which occupies the dorsal half of the wing; a thin indistinct black line parallel with termen; cilia dark fuscous with a faint ochreous base line. Hindwing shiny light fuscous; underside of wing with strong golden reflections. Abdomen dark fuscous with golden ochreous underside and anal tuft. Legs ochreous with fuscous tarsi. The males have a thin golden yellow hair-pencil on each side of thorax at the base of the forewings, which can be expanded up over the base of the wing.

*Alar expanse.*—20 mm.

*Habitat.*—Tabogilla Island and Porto Bello, Panama, February, April.

*Type-specimen.*—Cat. No. 16673, U.S.N.M.

Closely allied to *D. arotrosema* Walsingham and *D. varronia* Busck, and at once recognizable by its striking longitudinal wing pattern.

### DICHOMERIS EXCAVATA, new species.

Second joint of labial palpi smooth, *Trichotaphe*-formed, golden orange, shaded on the upper side with black; terminal joint ochreous, strongly suffused with black. Face silvery white; head deep metallic blue. Thorax metallic blue, laterally ochreous; patagina blue, ochreous at tip. Forewing with undulating costa, strongly arched at basal third, depressed on the middle and again arched at apical third; dorsal edge strongly excavated beyond the middle; tornus prominent; metallic blue with dark brown markings; at basal third is a broad, outwardly convex deep brown velvety fascia; entire terminal third of the wing deep blackish brown with a costal blue blotch extended as a thin, blue, marginal line around the edge; on the middle of the wing are four large, poorly defined, round, brown spots; cilia golden brown with a basal marginal black line. Hindwing dark fuscous with bluish cilia; costa produced at apical fourth and there clothed with a tuft of long, bluish black cilia. Abdomen bluish black. Legs bluish black with narrow ochreous tarsal annulations.

*Alar expanse.*—14 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16674, U.S.N.M.

Easily recognized by the bizarre wing form and the metallic coloration

### DICHOMERIS PERCEPTELLA, new species.

Labial palpi smooth, *Trichotaphe*-formed; second joint but slightly thickened with smoothly appressed scales; third joint slender, black exteriorly, dark fuscous, iridescent on the inner side and with a thin longitudinal white line in front from base to apex. Face and head dark bluish fuscous. Thorax dark bluish brown. Forewings blackish brown with a violet sheen and with three, large, conspicuous, reddish orange blotches occupying about half of the wing space; the first of these orange spots lies on the basal third of costa and extends obliquely outward and downward over the cell beyond the fold, nearly, but not quite, to the dorsal edge, ending in a sharp point above the middle of the dorsum; the second ochreous spot lies on apical third of costa, is like the first, irregularly pentagonal, with a point toward but not reaching dorsum and a sharp attenuated point toward apex; the third smaller orange spot, on costa, just before apex is drop-shaped and is continued as a submarginal yellow line along termen and dorsum, ending between the two large orange spots; cilia blackish fuscous. Hindwing nearly black. Abdomen black with whitish underside and small ochreous anal tuft. Legs black with narrow white annulations at the joints.

*Alar expanse.*—14–15 mm.

*Habitat.*—La Chorrera, and Cabima, Panama, May, June.

*Type-specimen.*—Cat. No. 16675, U.S.N.M.

### DICHOMERIS LUMINOSA, new species.

This is the Atlantic representative of the foregoing species, very similar in coloration and easily mistaken for it but quite distinct, both in structure and ornamentation. Labial palpi dark steel gray, with a thin, anterior, longitudinal, reddish orange line from base to apex; second joint smoothly thickened with compressed scales; terminal joint with compressed tuft of scales on its posterior edge. Face silvery fuscous. Head and thorax dark brown; base of patagina silvery. Forewings nearly identical in color and ornamentation with those of *perceptella*, but with the blackish brown part even more violet iridescent, with a light yellow inner edge of the first orange spot, with a light yellow central dash in the second orange spot and with this spot more rounded and without the dorsal and apical attenuations found in *D. perceptella*. Hindwings, abdomen and legs colored like the foregoing species.

*Alar expanse.*—14 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16676, U.S.N.M.

I also have a specimen of this species from St. Jean, French Guiana W. Schaus, collector.

### DICHOMERIS CORNUTA, new species.

Both joints of labial palpi smooth in front but with compressed tufts of scales posteriorly; dark fuscous with a bluish sheen and with extreme tip ochreous. Face light iridescent. Head dark fuscous. Antennæ ochreous with narrow, dark fuscous annulations. Anterior edge of thorax and base of patagina dark fuscous; rest of thorax light golden brown. Forewings light golden brown with base of costal edge and a large, triangular spot on apical third of costa dark brown, the edges of which are strongly iridescent; at the end of the fold is a dark brown spot, surrounded by strongly iridescent scales; at apical fifth is a perpendicular, dark brown line across the wing tip edged exteriorly with a strongly iridescent patch of steel blue scales; apical cilia golden ochreous; terminal cilia dark brown with ochreous base and preceded by dark brown marginal line. Hindwing dark fuscous. Abdomen dark fuscous with ochreous anal tuft and silvery white underside. Legs fuscous with narrow indistinct ochreous tarsal annulations.

*Alar expanse.*—13 mm.

*Habitat.*—Corozal and Trinidad River, Panama, March and June.

*Type-specimen.*—Cat. No. 16677, U.S.N.M.

### DICHOMERIS STELLATELLA, new species.

Labial palpi with smoothly appressed scales, light golden ochreous, shaded with dark metallic blue exteriorly. Lower face light ochreous; upper face, head, and thorax dark metallic bluish black. Forewing dark brown suffused with metallic blue and with scattered single silvery and light blue scales; a few of these congregate to form an ill-defined costal spot at apical third. Cilia blackish brown. Hindwing dark brownish fuscous. Abdomen bluish black with silvery white underside. Legs dark fuscous, with narrow ochreous tarsal annulations.

*Alar expanse.*—9 mm.

*Habitat.*—Taboga Island, Panama, February.

*Type-specimen.*—Cat. No. 16678, U.S.N.M.

## PAVOLECHIA, new genus.

*Type.*—*Pavolechia argentea*, new species.

Labial palpi long, slender, smooth, recurved; second joint slightly thickened with smoothly appressed scales; terminal joint half as long as second, thin, acute. Antennæ simple, shorter than the forewings. Head and thorax smooth. Forewings with costa straight to apical fourth, thence deflected; apex tolerably pointed; termen oblique, slightly sinuate; tornus rounded; 11 veins; one costal vein [9] absent or 7 and 8 coincident, stalked with 9; 2, 3, 4, and 5 nearly equidistant; 4 from the corner of the cell; 1 *b* furcate at base. Hindwings quite as broad as the forewings, broadest at tornus; with color pattern; costa straight; apex blunt; termen not much oblique and hardly sinuate; 7 veins; vein 5 absent; 3 and 4 connate; 6 and 7 connate. Posterior tibiæ hairy above.

Related to *Menesta* Clemens and the *Dichomeris* group; amply differentiated from any described genus by the venation and by the ornamented hindwings, which give it a *Choreutid* appearance.

### PAVOLECHIA ARGENTEA, new species.

Second joint of labial palpi bright saffron yellow; terminal joint dusky. Face ochreous fuscous. Antennæ dark brown. Head and thorax greenish or purplish metallic brown, according to the light. Forewings dark blackish brown with a bright, bluish metallic sheen; a round, silvery white dot on the cell and an oblong, silvery white dash at the end of the cell; cilia golden yellow at apex, otherwise dark brown. Hindwings blackish brown with a large silvery white spot on the middle of costa and a somewhat smaller similar spot just below it on the dorsal edge; apical cilia tipped with silvery white; on the underside is a complete silvery white fascia in the place of the white spots and a less complete narrower white fascia at basal fourth; underside of the forewing has the two silvery white spots of the upper side and a third such spot below them on the dorsal edge. Abdomen blackish brown, iridescent on upper side; underside silvery white. Legs blackish brown with silvery white annulations on the middle and at the tip of the tibiæ.

*Alar expanse.*—11 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16679, U.S.N.M.

A brilliant day-flying moth reminding one of the genus *Brenthia* Clemens.

### PROMENESTA, new genus.

*Type.*—*Promenesta lithochroma*, new species.

Labial palpi long, recurved; second joint slightly thickened with appressed scales; terminal joint slender, acute, nearly as long as second. Antennæ three-fourths the length of the forewings. Forewings with costa gently arched; apex rounded; termen perpendicular; dorsum straight; 10 veins: 7 and 8 coincident; 2 and 3 coincident; rest separate. Hindwings broader than the forewings, apex blunt; termen and dorsum rounded; 8 veins: 6 and 7 stalked; 3 and 4 stalked; 5 approximate to 4. Posterior tibiæ rough-haired above.

Correlated with *Menestra* Clemens, from which it differs by having 3 and 4 in the hindwings stalked, not coincident.

### PROMENESTA LITHOCHROMA, new species.

Labial palpi light ochreous; second joint shaded with fuscous exteriorly. Face light strawcolored, nearly white, iridescent. Head light strawcolored. Antennæ light ochreous. Thorax light saffron yellow. Forewings light saffron without any markings; edges and apical part slightly darker. Hindwing light yellow. Abdomen light ochreous with whitish iridescent underside. Legs light strawcolored; tarsi dusky.

*Alar expanse.*—12–13 mm.

*Habitat.*—Alhajuela, Trinidad River, and Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16680, U.S.N.M.

### PROMENESTA MARGINELLA, new species.

Labial palpi white; second joint with base blackish brown and with a brown bar exteriorly; terminal joint with base and an annulation just before the tip blackish brown. Face pure white, iridescent. Head dark greenish fuscous. Antennæ dark fuscous with white bases. Thorax dark olive brown. Forewings dark olive brown with costal, apical, and terminal edges narrowly bright saffron yellow; just before the terminal edge is a marginal series of black dots; cilia yellow. Hindwings dark fuscous. Abdomen dark fuscous above with silvery white underside. Legs strawcolored with dusky tarsi.

*Alar expanse.*—10 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16681, U.S.N.M.

Looks like a dimunitive *Stenoma marginata* Busck. (See p. 49.)

## Family ŒCOPHORIDÆ.

### HAMADERA, new genus.

*Type.*—*Hamadera aurea*, new species.

Labial palpi long, thin, sickle formed; second joint but slightly thickened with smoothly appressed scales; terminal joint much longer than second, slender, acute. Antennæ somewhat longer than forewings, simple, without pecten on basal joint. Head and thorax smooth. Forewings with costal and dorsal edges nearly straight and parallel but both slightly concave at the end of the cell; apex and termen evenly rounded; 11 veins: 7 and 8 coincident; 2 and 3 connate from the corner of the cell; 4 from the end of the cell; 5 distant; 6 to apex; 9 and 10 from near the end of the cell; 11 from before middle; 12 in the female normal, in the male curved downward and running into vein 11 at its basal third, with the membrane above it thickened; 1 *b* furcate at base. Hindwings as broad as the forewings; costa straight; apex bluntly pointed; termen and dorsum evenly rounded; 8 veins: 3 and 4 stalked; 5 parallel with 4; 6 and 7 parallel; 8 free. Posterior tibiæ nearly smooth.

Agreeing with *Fabiola* Busck and *Himotica* Meyrick in having veins 7 and 8 in the forewings coincident; differs from both in the long antennæ and the very long terminal joint of the palpi; *Fabiola* has 2 and 3 in the forewings widely separate; *Himotica* has these veins stalked and the present genus has 2 and 3 connate.

### HAMADERA AUREA, new species.

Labial palpi blackish with basal half of second joint golden yellow. Face, head, and thorax metallic blue, strongly iridescent. Antennæ deep black with a broad, white annulation just before the tip. Basal half of the forewings deep black, with a broad, semicircular, metallic blue band from near the base to just before the middle of the costa; the ends of this band on the very edge white; a large, contiguous, metallic blue spot on the fold near base and another similar one on the middle of the fold, neither reaching the dorsal edge; apical half of the wing deep golden yellow, which color sends a broad projection into the dark basal part on the middle of the cell; extreme tip of the wing and a slender projection therefrom into the yellow part dark violaceous, strongly metallic and iridescent; apical cilia purplish black; terminal cilia dusky golden. Hindwings blackish brown with the costal edge above vein 8 silvery white; cilia dark bronze. Abdomen blackish fuscous above; underside silvery white. Legs blackish with broad light yellow bands and narrow yellow annulations on the tarsal joints

*Alar expanse.*—11–12 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16682, U.S.N.M.

A brilliantly colored species, which reminds in a noteworthy degree of the similarly sized *Dichomeris exteriorella* Walker and *D. luminella* Busck; like these species, it is a day-flying, sun-loving insect.

### COSTOMA, new genus.

*Type.—Costoma basirosella,* new species.

Labial palpi long, recurved, smooth; second joint somewhat thickened with scales; terminal joint shorter than second, stout, acute. Antennæ simple, without pecten on basal joint. Head and thorax smooth. Forewings elongate ovate; costa and dorsum slightly and evenly curved; apex and termen rounded; 12 veins: 2 and 3 stalked; 7 and 8 stalked; 9 out of the stalk; 7 to apex; 11 from before middle of cell; 1 *b* furcate at base. Hindwings as broad as the forewings; costa straight; apex blunt; termen and dorsum evenly rounded; 8 veins: 3 and 4 stalked; 5 parallel; 6 and 7 separate and parallel. Posterior tibiæ hairy above.

### COSTOMA BASIROSELLA, new species.

Labial palpi, face, and head bright yellow. Thorax purplish brown, edged laterally with pink; patagina pink with brown base and yellow tip. Base of the forewings light pink, on the costa yellow; this bright colored base is sharply limited outwardly by a narrow, blackish brown, transverse fascia; beyond this fascia the wing is dark olive brown with the costal edge from basal fourth outwardly, broadly yellow, and with the entire apical, terminal, and dorsal edge narrowly yellow. Hindwings dark brownish fuscous. Abdomen blackish above; underside and anal tuft yellow. Legs yellow with dark brown tarsal annulations.

*Alar expanse.*—31 mm.

*Habitat.*—Trinidad River, Panama, June.

*Type-specimen.*—Cat. No. 16683, U.S.N.M.

This large, handsome species has a noteworthy resemblance to the somewhat larger Arctiid moth, *Automolis* (*Cratoplastis*) *diluta* Felder.[1] and even more strikingly so to the Lithosiid *Diarhabdosia coroides* Schaus[2] and to the Stenomid moth, *Stenoma lampyridella* Busck,[3] both of which were taken at the same place and at the same time as *Costoma basirosella*. The same coloration in all these species, though differently placed, give the same general impression at first sight; they all probably imitate a large lampyrid beetle, *Cratomorphus* sp., which occurred commonly at the same time and place as the last three named Lepidoptera and which both in flight and alighting resemble them very remarkably.

### RHINDOMA, new genus.

*Type.*—*Rhindoma rosapicella*, new series.

Labial palpi long, recurved; second joint comparatively short, somewhat thickened with scales, rough anteriorly; terminal joint more than twice as long as second, rather stout, compressed, with rough anterior edge; apex acute. Antennæ longer than the forewings, simple; basal joint without pecten. Forewings elongate; costa sinuate beyond middle; apex rounded; termen oblique; dorsum straight; 12 veins: 7 and 8 stalked; 7 to below apex; 2, 3, and 4 approximate, but separate. Hindwings narrower than the forewings; costa sinuate beyond the middle; apex and termen rounded; 8 veins: 3 and 4 stalked; 5 cubital but distant; 6 and 7 separate and parallel. Posterior tibiæ rough above.

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[1] Reise *Novara*, 1867, pl. 102, fig. 8.

[2] Ann. Acad. Nat. Hist. (8), vol. 7, 1911, p. 368.

[3] See p. 41.

The long and rather stout antennæ and the remarkably long terminal joint of the labial palpi easily separate this genus. It differs from *Lupercalia* Busck, *Filinota* Busck, and *Mnesichara* Walsingham, which it resembles in the long antennæ, in having vein 7 of the forewing to termen, in 3 and 4 of the forewing separate, and in 3 and 4 of the hindwing stalked, not coincident.

### RHINDOMA ROSAPICELLA, new species.

Labial palpi blackish brown; terminal joint with light ochreous tip. Antennæ light ochreous. Head and thorax blackish brown; face a shade lighter. Forewings with large dorsal patch, reaching to the end of the cell, blackish brown; costal area above this patch and terminal area beyond it light ochreous; at apical third is an elongate blackish brown costal streak edged toward the base with orange scales and apically with light rose-colored scales; these latter persist in a narrow band around apex and include a dark brown subapical spot; a few rose-colored scales are also found below the costal spot and an indistinct and ill-defined orange streak crosses the apical light ochreous area.

Hindwings dark brownish fuscous, with rose-colored tip. Abdomen brownish fuscous above, underside and anal tuft ochreous. Legs light ochreous, shaded externally with blackish brown; tarsal joint dark brown with narrow ochreous annulations.

*Alar expanse.*—12–13 mm.

*Habitat.*—Alhajuela and Trinidad River, Panama, April, May.

*Type-specimen.*—Cat. No. 16684, U.S.N.M.

## Genus PSILOCORSIS Clemens.

*Type.*—*Psilocorsis quercicella* Clemens.

### PSILOCORSIS CRUCIFERA, new species.

Second joint of labial palpi light yellow mottled with wine red; terminal joint yellow with a broad, wine-red band on the middle. Face light-straw yellow. Head and thorax light yellow, mottled with wine red. Antennæ dark brown with basal joints wine red. Forewings light yellow with all the veins sharply outlined in wine red; costal and terminal edges dark brown; a dark brown line from just before middle of costa across the wing to tornus; another dark-brown line from base to basal third of dorsum and thence upward to the end of the cell touching the other brown line nearly at right angles; a thin, irregularly wavy, outwardly curved, brown line from apical third of costa across the wing to middle of dorsum; cilia dark brown. Hindwings light iridescent yellow with the margin light rose colored; cilia light golden yellow. Abdomen light yellow. Legs light yellow touched on the outer sides with rose.

*Alar expanse.*—16–19 mm.

*Habitat.*—Trinidad River and Cabima, Panama.

*Type-specimen.*—Cat. No. 16686, U.S.N.M.

Allied to *P. traili* Butler, but easily distinguished by its wing pattern. In the United States National Museum are also specimens from St. Jean, French Guiana, and from Sixola River, Costa Rica, W. Schaus, collector.

## Genus PELEOPODA Zeller.

*Type.*—*Peleopoda lobitarsis* Zeller.

### PELEOPODA IMPERIELLA, new species.

Labial palpi light brick red, terminal joint light yellow. Face and head yellowish white. Antennæ reddish yellow. Thorax silvery white. Forewings silvery white with a violet sheen and strongly overlaid with light brick red, except on a broad longitudinal curve from base of dorsum up to middle of costa and to termen; base and apical third of costal edge light brick red; a large poorly defined dorsal area covering nearly half the wing reddish yellow with the upper edge broadly saffron; cilia golden yellow. Hindwings reddish yellow with slightly paler cilia. Abdomen reddish yellow. Legs reddish yellow with yellowish white tibiæ and tarsal tufts.

*Alar expanse.*—32 mm.

*Habitat.*—La Chorrera, Panama, May.

*Type-specimen.*—Cat. No. 16687, U.S.N.M.

The largest described species of the genus, closely allied to *P. reginella* Busck, but yellow in general tone where the other species is wine red.

## ANCIPITA, new genus.

*Type.*—*Ancipita atteria,* new species.

Second joint of labial palpi very long, slender, compressed with slightly rough scales just before apex; terminal joint less than half the length of second, slender, smooth, acute. Antennæ as long as the forewings, without basal pecten. Forewings elongate, ovate, apex rounded; 12 veins: 7 and 8 stalked; 7 to apex; rest separate; 2, 3, 4, and 5, nearly equidistant. Hindwings as broad as the fore wings; apex rounded; costa straight; termen and dorsum evenly rounded; 8 veins: 3 and 4 connate; 6 and 7 parallel. Posterior tibiæ rough-haired above.

### ANCIPITA ATTERIA, new species.

Labial palpi golden yellow, strongly shaded with black on apical half of both joints. Face silvery white. Head golden yellow with a large, central, dark-blue, metallic patch. Antennæ yellow with narrow black annulations. Thorax saffron yellow with two, lateral, dark-blue, metallic spots and with the posterior tip blackish fuscous. Forewings brick red, with golden yellow costal and dorsal edges and with three, broad, longitudinal, black streaks from near base to just before the apical edge of the wing; these black bands are interrupted beyond the middle of the wing by a narrow, brick-red crossline, connecting the two edges of the wing; cilia black with a deep-blue metallic basal line. Hindwing brick red with apical third black; cilia black. Abdomen brick red with golden yellow underside. Legs red with black tarsal annulations.

*Alar expanse.*—17 mm.

*Habitat.*—Cabima, Panama, June.

*Type-specimen.*—Cat. No. 16688, U.S.N.M.

## Genus DOXA Walsingham.

*Type.*—*Doxa sodalis* Walsingham.

### DOXA VIRGINIA, new species.

Labial palpi, face, and head deep violet red, mottled with black. Antennæ black with basal joint violet. Thorax saffron yellow with anterior edge and base of patagina black. Forewing saffron yellow with costal edge darker yellowish brown, extreme base black, and with apical and terminal edge narrowly dark violet; an indistinct blackish brown spot on the middle of the cell; an even less distinct brown spot at the end of the cell; cilia bright violet dusted with black. Hindwings light yellow with rose-red edges and cilia. Abdomen and legs yellow.

*Alar expanse.*—12–13 mm.

*Habitat.*—Trinidad River, Panama, March, April, June.

*Type-specimen.*—Cat. No. 16745, U.S.N.M.

Smaller than the type of the genus, *Doxa sodalis* Walsingham, and at once distinguished by the dark violet head and dark edges of the wings.

Named in honor of my efficient assistant, Miss Pearl Virginia Boone.

## Genus CRYPTOLECHIA Zeller.

*Type.*—*C. straminella* Zeller.

### CRYPTOLECHIA IGNICOLOR, new species.

Labial palpi carmine red mottled with black. Face red with a small, central, yellow spot. Head and thorax carmine red mixed with yellow. Antennæ yellowish with basal joint carmine. Basal two-thirds of forewings light yellow, heavily overlaid with carmine scales; outer third dark violet red mixed with brown and carmine; entire costal edge from base to apex blackish brown; at the end of the cell is a curved blackish brown line; cilia blackish. Hindwings light carmine red with somewhat lighter cilia. Abdomen carmine red above with light yellow underside; legs yellow shaded with carmine.

*Alar expanse.*—28 mm.

*Habitat.*—Cabima, Panama, May.

*Type-specimen.*—Cat. No. 16746, U.S.N.M.

A showy species, allied to *Cryptolechia miniata* Dognin.

### CRYPTOLECHIA ILLUMINELLA, new species.

Labial palpi dark purplish red dusted with black. Antennæ dark brown. Face reddish ocherous. Head red. Thorax brown. Forewings golden brown; costal edge brick red; extreme base black; three indistinct darker brown transverse lines, one across the middle of the cell, one on the middle of the wing reaching across the wing, and at apical fourth inwardly curved at costa and not quite reaching the dorsal edge; terminal edge broadly dark brown with cilia dark reddish; dorsal cilia light brick red. Hindwings bright aniline red with slightly paler cilia. Legs golden brown, shaded externally with dark brown.

*Alar expanse.*—17 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16747, U.S.N.M.

The hindwings have the same striking shade as *C. ignicolor* Busck., from which it differs by its smaller size and brown striped forewings. It is nearer in size and ornamentation to *Cryptolechia incensatella* Walker, and *Cryptolechia fervida* Zeller, described from Brazil, in which the forewings, however, are also of a carmine red, not brown, as in the present species.

### CRYPTOLECHIA SULPHUREA, new species.

Second joint of labial palpi brick-red, mottled with yellow; terminal joint light yellow. Face brick red. Head sulphur yellow. Antennæ reddish. Thorax light yellow. Forewings glossy white with a strong violet sheen and overlaid with yellow scales; extreme base of costa, a longitudinal central line from base to termen and the apical edge, reddish yellow; cilia brown with purplish base and a black transverse line. Hindwings glistening light violet yellow with light yellow cilia. Abdomen and legs yellow.

*Alar expanse.*—30 mm.

*Habitat.*—Porto Bello, Panama, June.

*Type-specimen.*—Cat. No. 16748, U.S.N.M.

A large showy species, allied to *Cryptolechia crossota* Walsingham.

### CRYPTOLECHIA TUNICATA, new species.

Labial palpi, face and head light lemon yellow. Thorax light lemon yellow with posterior half and tips of the patagina rose red. The greater dorsal part of the forewings dark brown, edged below but along the costa from base to tornus by a broad curved band of rose red which is again limited along the extreme edge of the costa by lemon yellow, which color broadens out toward the apex and covers apical and terminal edge; on the middle of the cell is a large, pure white, comma-shaped spot with the thin end toward apex; this white spot is edged above and below by rose red and laterally by ill-defined black spots. Hindwing dark brown. Abdomen light fuscous. Legs light yellow.

*Alar expanse.*—20 mm.

*Habitat.*—Porto Bello, Panama, June.

*Type-specimen.*—Cat. No. 16749, U.S.N.M.

Allied to the foregoing species and to *C. crossota* Walsingham, but smaller and at once recognized by the large, white comma-shaped discal spot.

### CRYPTOLECHIA MARCELLA, new species.

Labial palpi yellowish red with dark brown base. Face light yellow; head and thorax light reddish brown. Antennæ dark brown. Forewings light reddish brown with lighter brick red costal and terminal edges; on the middle of the cell is a small black dot; at the end of the cell a similar somewhat larger dot and on the middle of the fold a third black dot; from the outer fourth of costa runs a broad but gradually narrowing blackish shade across the wing to outer fifth of the fold; this shading is poorly defined and single blackish scales are found outside of it on both sides; cilia reddish brown. Hindwings light golden yellow with tips and terminal edge rose colored; cilia golden. Abdomen light yellow. Legs light yellow, shaded externally with brown.

*Alar expanse.*—17–20 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16750, U.S.N.M.

Specimens also from St. Jean, French Guiana, and from Sixola River, Costa Rica, W. Schaus, collector.

### CRYPTOLECHIA CHORRERA, new species.

Labial palpi reddish ochreous; base of second joint blackish brown; terminal joint sprinkled with black scales. Antennæ ochreous, mottled with black. Face and head light ochreous. Thorax and forewings light violaceous brown; basal fourth of costal edge black; a small black dot on the middle of the cell, another at the end of the cell, and a similar one on the middle of the fold; a faint, outwardly curved series of black dots at apical fifth parallel with the apical and terminal edges, which are narrowly rose-colored; cilia golden. Hindwings dull fuscous with cilia concolorous and with the extreme edge whitish. Abdomen dark fuscous above, light ochreous below; anal tuft orange. Legs light ochreous, shaded on the outer sides with dark brown.

*Alar expanse.*—19–20 mm.

*Habitat.*—La Chorrera, Panama.

*Type-specimen.*—Cat. No. 16751, U.S.N.M.

### CRYPTOLECHIA ANALIS, new species.

Labial palpi reddish ochreous, dusted with black and with basal third of second joint blackish brown on the outer side. Antennæ blackish fuscous with bright reddish ochreous basal joints. Face and head light ochreous, the latter slightly reddish. Thorax brown. Forewings deer-brown with the edges and cilia brick red; a small black dot at the base of costa; an indistinct black dot at the end of the cell and one on the fold; an indistinct row of black dots across the wings parallel with the outer edge at apical fifth. Hindwings dark fuscous. Abdomen dark fuscous above, whitish on the underside. Legs whitish, shaded with dark brown exteriorly

*Alar expanse.*—14–15 mm.

*Habitat.*—Porto Bello, Panama, April.

*Type-specimen.*—Cat. No. 16752, U.S.N.M.

Close to *C. chorrera*, but smaller and distinguished by the bright reddish edges of the forewings.

### CRYPTOLECHIA NOTELLA, new species.

Labial palpi light ochreous, base of second joint shaded with black. Antennæ ochreous with narrow black annulations. Face light ochreous. Head slightly mixed with reddish ochreous. Thorax reddish ochreous. Forewings reddish ochreous with extreme base of costa black; a small black dot at base of wing; a large round black spot on middle of cell and a black ill-defined spot obliquely above this on the costal edge just before the middle; an indistinct, strongly outwardly curved series of black dots parallel with apical and terminal edges at apical fifth; a small black dot on the fold. Hindwings reddish ochreous with a strong sheen and with golden yellow cilia. Abdomen and legs whitish ochreous.

*Alar expanse.*—14–16 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16753, U.S.N.M.

Allied to the same group as the foregoing species, but smaller and at once distinguished by the conspicuous, black wing spots.

## Genus TERATOMORPHA Walsingham.

*Type.—Teratomorpha albifrons* Walsingham.

### TERATOMORPHA CHILIBRELLA, new species.

Labial palpi, face, head, and thorax whitish ochreous. Antennæ faintly annulated with darker ochreous. Forewings whitish ochreous, slightly and irregularly overlaid with single, dark-brown scales and with the costal edge and the veins somewhat deeper ochreous; the brown scales form two faint and ill-defined, outwardly curved lines across the wing, one submarginal and one parallel therewith on the middle of the veins; there is also an irregular aggregation of dark scales on the middle of the cell, tending downward to the dorsal edge; on the middle of the costa is a small group of dark-brown scales and at the end of the cell is a similar dark-brown spot; cilia ochreous white. Hindwings with costal edge deeply and sharply excavated at apical third; ochreous white, brownish below the costal excavation, with a faint brown submarginal shade and a thin brown line at the base of cilia.

*Alar expanse.*—20 mm.

*Habitat.*—Alhajuela, Panama, April.

*Type-specimen.*—Cat. No. 16754, U.S.N.M.

Bred from a large (30 by 10 mm.), thin, flat, semitransparent cocoon, spun on the middle of a leaf of a flower-bearing shrub growing in the upper Chilibrillo River near Alhajuela.

## Genus DECANTHA Busck.

*Type.—Decantha borkhausenii* Zeller.

### DECANTHA MINUTA, new species.

Labial palpi ochreous white. Face silvery. Head and thorax light ochreous fuscous. Antennæ ochreous with narrow black annulations. Forewings broad in proportion to their length; light ochreous fuscous, with the costal edge narrowly bright orange and with light ochreous cilia; at the end of the cell is a large, round, dark-brown spot; underneath this at the end of the fold is a similar blackish brown spot, not so clearly defined and around apical edge are a few scattered dark-brown scales. Abdomen dark fuscous above; underside light ochreous. Legs light ochreous.

*Alar expanse.*—6.5 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16755, U.S.N.M.

### Genus TRICLONELLA Busck.

*Type.—Triclonella pergandeella* Busck.

#### TRICLONELLA SEQUELLA, new species.

Labial palpi black, second joint with two anterior longitudinal lines throughout its length; terminal joint with one such line. Face, head, and thorax black. Antennæ black with a white dash on each segment. Forewings blackish brown, with a large golden yellow area covering more than half the wing space; the yellow area begins with sharp perpendicular limits at basal fifth and covers the central part of the wing to apical fourth, except for a large, triangular, black, costal spot just beyond the middle and a smaller, elongate, triangular, opposite spot, which touches the apical black part of the wing; a marginal row of faint, small, yellow dots; cilia blackish fuscous. Hindwings light fuscous. Abdomen blackish fuscous. Legs blackish fuscous with narrow white annulations at the joints.

*Alar expanse.*—8–10 mm.

*Habitat.*—Paraiso, La Chorrera, Corozal, and Porto Bello, Panama, April, May.

*Type-specimen.*—Cat. No. 16692, U.S.N.M.

Closely allied to and intermediate between *T. determinatella* Zeller, and *T. euzosta* Walsingham, but amply different from both in pattern.

### Genus BORKHAUSENIA Hübner.

*Type.—Borkhausenia minutella*, Linnæus.

#### BORKHAUSENIA CLEVELANDI, new species.

Labial palpi white, sparsely sprinkled with brown dots and with outer side of base of second joint brown. Face, head, and thorax pure white. Antennæ dark brown with white basal joints. Forewings white overlaid with bluish, black, brown, and ochreous scales except for a broad subcostal streak, which is unmottled white; basal two-thirds of costal edge ochreous brown dotted with black; on the middle of the wing are two groups of raised yellowish brown scales, the upper one of which is preceded by a black dash; on the middle of the cell at apical third are two similar yellowish brown tufts of raised scales, followed by a black dash and a bluish area; the dorsal half of the wing is rather heavily overlaid with blue scales and has a small black dot just within the middle of dorsum; an irregular series of ochreous brown scales before the terminal edge; cilia bluish mixed with brown and black. Hindwing light ochreous fuscous, with whitish cilia. Abdomen light ochreous fuscous, with series of black spots on the under side. Legs blackish, with ochreous tibial tufts and ochreous annulations and bars.

*Alar expanse.*—15–16 mm.

*Habitat.*—La Chorrera, May (Busck, coll.), and Porto Bello, Panama, October (Cleveland, coll.).

*Type-specimen.*—Cat. No. 16693, U.S.N.M.

Agreeing with the genus in venation and oral characters but rather aberrant in coloration and in the tufts of raised scales in the forewings. The scaling is rather loose and easily rubbed so as to obliterate part of the ornamentation.

Named in remembrance of my friend, Mr. G. F. Cleveland, with whom I had many happy collecting trips in the country around Porto Bello.

Mr. Cleveland secured this species and many others not treated here, in the autumn at the height of the rainy season, in which I personally have had no opportunity to collect.

### Genus EPICALLIMA Dyar.

*Type.*—*Epicallima argenticinctella* Clemens.

#### EPICALLIMA TABOGA, new species.

Labial palpi grayish fuscous; apex of second joint white. Face, head, and thorax light ochreous. Forewings whitish ochreous, overlaid with light fuscous and with conspicuous, black, round dots; extreme base of costal edge black, a black spot on the middle of the cell; another obliquely below on the fold and a third above on the base of vein 10, the latter often fainter; a black dot at the end of the cell and a marginal series of eight to ten black dots around the costal and terminal edge terminating in a somewhat larger dot at the beginning of the dorsal cilia; cilia ochreous fuscous. Hindwings light ochreous fuscous. Abdomen light fuscous. Legs ochreous with dusky tarsi faintly annulated with ochreous.

*Alar expanse.*—8–10 mm.

*Habitat.*—Taboga Island, Panama, June.

*Type-specimen.*—Cat. No. 16694, U.S.N.M.

A small distinctively marked species reminding in size and coloration of *Borkhausenia ascriptella* Busck.

## Family ETHMIIDÆ.

### Genus ETHMIA Hübner.

*Type.*—*Ethmia aurifluella* Hübner.

#### ETHMIA FESTIVA, new species.

Second joint of labial palpi blackish brown; terminal joint white. Antennæ brown with white bars. Lower half of face brown, upper half and top of the head white; a narrow collar of bluish black. Thorax white with a thin transverse bluish black line anteriorly and a broad black line across the posterior tip; patagina white. Forewings white with black and golden yellow markings; costal edge black at base, golden yellow on the outer half; from the black part run three nearly parallel transverse lines across the wing to dorsum, one near the base of the wing, one at basal fourth, and one near the middle of the wing; adjoining the last of these lies a large square golden yellow dorsal spot, black margined also posteriorly and partly on top and below; on the apical half of the wing is a spider-web of five black lines radiating from a black, white-centered ring; two of these irregular lines run to the costal edge, one joins the exterior black edge of the yellow dorsal spot, one goes to the dorsal edge and one joins a transverse black line across the wing at apical fifth beyond which the tip of the wing is golden yellow. Hindwing light golden fuscous. Abdomen dark fuscous with underside and anal tuft saffron yellow. Underside of thorax silvery white. Legs yellow, tarsal joints slightly tipped with black.

*Alar expanse.*—19–20 mm.

*Habitat.*—Porto Bello, Panama, May.

*Type-specimen.*—Cat. No. 16695, U.S.N.M.

A clearly marked, pretty species, nearest to the larger *E. delliella* Fernald, from which it is at once distinguished by the large yellow dorsal spot, and to *E. cypraeella* Zeller, from Venezuela.

### ETHMIA UNGULATELLA, new species.

Second joint of labial palpi black; terminal joint dirty white. Face blackish. Head white; collar narrowly black. Thorax white with a large central spot and a posterior transverse streak bluish black; extreme posterior tip white. Forewings white suffused along the costa with a smoky brown color more widely along the middle, where two blunt lobes of this color reach into the cell; on basal fourth lie six bluish black metallic spots, four above the fold and two below it; on the middle of the dorsum rests a large semicircular bronzy brown spot edged above on the middle of the cell by an elongate smoky brown streak, and transversed by a thin interrupted silvery blue zigzag line; apical part of the wing is similarly bronzy brown; also transversed by a thin white zigzag line and edged toward the base of the wing by a cloudy smoky brown area; two detached smoky brown dots lie between this and the large dorsal spot; cilia smoky brown with silvery white base. Hind wings shiny dark fuscous with white cilia. Abdomen dark fuscous above, with third joint velvety yellow, silvery white laterally and with a deep black ventral streak; anal tuft saffron yellow. Legs smoky brown exteriorly, silvery white on their inner sides.

*Alar expanse.*—Female, 23 mm.; male, 16 mm.

*Habitat.*—Cabima and Alhajuela, Panama. May.

*Type-specimen.*—Cat. No. 16696, U.S.N.M.

Nearest and quite similar to *E. terpnota* Walsingham, but smaller and at once differentiated by the coppery brown wing tips and by the striking abdominal coloration.

### ETHMIA ELUTELLA, new species.

Labial palpi dark gray with white apex. Face dark brown with bluish metallic sheen. Head, collar, and patagina white. Thorax white with a large, dark bluish brown center occupying most of the area. Forewing satiny white with the ground color largely obscured by extensive gray and purplish brown marking; costal half above the fold clouded by large, rounded, light gray spots, nearly confluent on basal half; at apical third is an unmottled, pure white costal area; apical tip of the wing and base of the cilia dark purplish brown; on the middle of dorsum lies a large, semicircular, dark purplish brown spot, transversed by irregular, faint, silvery, zigzag lines. Hindwings light fuscous with white cilia. Abdomen dark fuscous above with second joint velvety ochreous; underside silvery white. Legs white; tarsi dusky.

*Alar expanse.*—14 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16697, U.S.N.M.

Allied to the foregoing, but smaller and lighter and lacking the dark blue metallic spots on basal half of the forewings.

## Family STENOMIDÆ.

### Genus CATARATA Walsingham.

*Type.*—*Catarata lepisma* Walsingham.

In the definition of this genus in the Biologia Centrali-Americana it is stated that vein 4 is out of the stalk of vein 2+3 in the forewings. This, however, is not the case in either of the two species described, the type *C. lepisma* Walsingham and *C. stenota* Walsingham. With the evidence of additional material the specific identity of these is apparent; the species is quite variable; *stenota* was founded on two rubbed specimens in poor condition, and the name should be placed as a synonym of *C. lepisma* Walsingham. Types and cotypes of both are in the U. S. National Museum, and I now have a large series from all parts of Panama; the species has vein 4 approximate to but separate from 2+3.

Such is also the condition in the two following species, while in the third, *C. obnubila*, the veins are as described by Lord Walsingham. These modifications, which in any of the higher families, Gelechiidæ, Oecophoridæ, or Cosmopterygidæ, would be definite and sound grounds for generic differentiation, I do not consider of such value in the generically far less crystalized family Stenomidæ.

### CATARATA LAPILELLA, new species.

Labial palpi dirty ochreous white, shaded externally with dark fuscous. Face whitish iridescent. Head and thorax light fuscous. Forewings dirty ochreous white, iridescent, toward the base and below the fold somewhat darker than on outer half; entire costal edge and the tip of the wing dusky dark fuscous; from the inner angle of the wing runs a slightly curved, ill-defined, broad, blackish brown streak upward across the fold and the cell to the middle of costa; at the end of the cell are a few ochreous scales and the costal apical part of the wing contains several small brown and black spots not very definitely arranged in two curved lines; cilia whitish. Hind wings light fuscous. Abdomen dark fuscous above, underside and legs whitish ochreous; tarsal joints dusky.

*Alar expanse.*—12 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16703, U.S.N.M.

### CATARATA PUMILIS, new species.

Labial palpi white; second joint with base and an indistinct annulus before apex dark brown. Face and basal joint of the antennæ pure white. Head brownish gray. Thorax dark brown with anterior edge and the tip of the patagina pure white. Forewing dark brown with costal edge from basal third pure white; a white, thin, zigzag line runs from the middle of costal edge obliquely across the wing to apical third of dorsum; a broad white streak parallel with and just before the apical and terminal edge, an indistinct darker brown spot on the middle of the cell and another similar one on the middle of the fold; cilia whitish. Hindwing dark fuscous with cilia a shade lighter. Abdomen dark fuscous above, light ochreous on the underside. Anterior legs pure white; posterior legs light fuscous with whitish tarsi.

*Alar expanse.*—12 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16704, U.S.N.M.

A pretty little species reminding in coloration and pattern of the somewhat larger *Stenoma filiferella* Walker.

### CATARATA OBNUBILA, new species.

Labial palpi dark brown. Head and thorax blackish brown. Forewings blackish brown toward the base and along the costal edge; this color gradually shades into a light olive gray which covers the greater outer part of the wing; from apical fourth of costal edge runs a broad, reddish brown streak obliquely across the tip of the wing to tornus and outside this streak the wing is iridescent, metallic violaceous; cilia violet. The males have on the underside of the forewings near base a large tuft of hairs, at rest lying longitudinally and covering basal two thirds of the cell. Hindwings with unusually well-developed costal area, dark fuscous. Abdomen blackish fuscous above with silvery underside. Legs ochreous fuscous with dusky tarsi.

*Alar expanse.*—12–13 mm.

*Habitat.*—Trinidad River and Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16705, U.S.N.M.

### CATARATA OCELLATA, new species.

Labial palpi milky white with a small dark fuscous spot on the outer side of second joint. Face milky white. Head and thorax dark purplish brown, nearly black. Forewing blackish brown with purplish reflections; at the end of the cell is a black dot surrounded by an incomplete circlet of pure white scales; above and before this eyespot are a few scattered white scales and a few white scales are found on the fold; cilia blackish fuscous. Hindwing blackish brown. Abdomen above dark brown; entire body below silvery white; anal tuft large, ochreous. Legs silvery white; first tarsal joints black exteriorly.

*Alar expanse.*—14 mm.

*Habitat.*—La Chorrera, Panama, May.

*Type-specimen.*—Cat. No. 16707, U.S.N.M.

Closely allied to *C. obnubila* Busck, but darker and larger and at once recognized by its white palpi and face.

### CATARATA CURVILINIELLA, new species.

Labial palpi white; second joint with base black externally; terminal joint with extreme base and an annulus just before the tip black. Lower face lead colored, upper face and head white. Antennæ ochreous fuscous with white basal joints. Thorax white. Forewings white faintly mixed with ochreous scales and with black markings; from near base of costa runs a thin black line obliquely downward and outward to the middle of the cell and thence to the end of the cell, where it curves upward and inward forming an elongated question mark; at the end of the cell this black line is edged by yellow scales; on the middle of the costa is a small, black, outwardly directed spur and at apical third is a similar, inwardly directed, black spur; parallel with the terminal edge at apical fourth is a faint row of yellowish scales, and in fresh specimens the wing is sparsely sprinkled with black scales; these and the yellow lines, however, are easily rubbed off and are lost in most flown specimens; cilia white Hindwing light fuscous with whitish cilia. Abdomen fuscous with whitish underside and yellow anal tuft. Legs white, tarsi annulated with black.

*Alar expanse.*—15–17 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16706, U.S.N.M.

Reminding in size, color, and ornamentation of our North American *Agonopteryx curviliniella* Beutenmüller.

### Genus ATHLETA Walsingham.

*Athleta* Walsingham, Biologia Centrali-Americana, vol. 4, Heterocera, 1912, p. 155.

*Type.*—*Athleta trisecta* Walsingham.

In the description of the genus *Athleta* vein 2 of the forewing is given as separate and distant from vein 3. Such, however, is not always the case in the type species under consideration. With several additional specimens from Porto Bello and Trinidad River, Panama, it is found that this character is not stable within the species, but that vein 2 may be separate, connate, or even short stalked with vein 3. Similar instability of these veins within the species is found in other groups of this family and makes the character of little value generically. The genus *Athleta* may, however, be separated from its nearest ally, *Catarata* Walsingham, by the anastomosis of veins 2 and 1*c*, which appears to be constant; from whatever starting point vein 2 runs nearly at right angles downward and into vein 1*c*, separating from it again just before tornus. The male of this species, which was not known at the time of the description, has a very noticeable short fold along vein 1*b* of the hindwings, which contains a large expansible tuft of yellowish hairs

#### ATHLETA NIGRICANS, new species.

Labial palpi white sprinkled with dark fuscous; second joint with two ill-defined dark fuscous bars exteriorly, one at base and one near the tip; terminal joint with a dark fuscous annulation at the base, one just before the tip and a dark intermediate spot in front. Face silvery white. Head white, slightly mixed with fuscous. Thorax dark brown with anterior edge and base of patagina white. Forewing dark brownish fuscous with cilia and terminal edge silvery white; extreme base of costa and apical two-thirds of costal edge silvery white also. Hindwing dark fuscous with cilia a shade lighter. Abdomen dark fuscous above, silvery white on the underside. Legs silvery white with anterior tibiæ and tarsi barred with dark brown and with posterior tibiæ yellowish.

*Alar expanse.*—12 mm.

*Habitat.*—Trinidad River, Panama, June.

*Type-specimen.*—Cat. No. 16708, U.S.N.M.

Resembling in coloration and markings *Stenoma marginata* Busck. (See p. 49.)

### Genus ZETESIMA Walsingham.

*Type.—Zetesima lasia* Walsingham.

#### ZETESIMA PORTENTOSA, new species.

*Male.*—Labial palpi light reddish ochreous; second joint dusted with dark brown exteriorly; brush on the middle of terminal joint blackish brown. Face silvery white. Head light brown. Antennæ reddish brown. Thorax blackish brown. Forewings dark brown with obscure, blackish brown markings and with light ochreous costal and terminal edges; a strong costal fold reaching nearly to the middle of the wing contains a cluster of long, broad, iridescent scales; a round black dot at the end of the cilia, edged by ochreous scales; a black, ill-defined streak on the outer and upper edge of the cell; a series of ill-defined, black, marginal spots around the costal, apical, and terminal edges; upper part of cilia ochreous, lower part dark fuscous. Hindwings blackish brown with light ochreous costal space covered by the forewings. Abdomen blackish fuscous, with light ochreous underside. Legs light ochreous brown.

*Alar expanse.*—16 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16709, U.S.N.M.

Identical in structure of palpi and wings with the type of the genus, but larger and much darker brown.

### Genus STENOMA Zeller.

*Type.—Stenoma litura*, Zeller.

#### STENOMA CLARIPENNIS, new species.

Second joint of labial palpi white with a dark brown annulation just before its apex; terminal joint strongly suffused with dark fuscous and with dark brown base. Face silvery white. Antennæ dark brown. Head and thorax dark olive brown. Forewing dark olive brown with the veins outlined in light greenish yellow; costal, apical and terminal edge narrowly light ochreous; cilia light brown. Hindwings dark greenish fuscous with costal area, covered by the forewings, white. Abdomen dark olive brown above, underside silvery. Legs silvery white, tarsi dusky.

*Alar expanse.*—16 mm.

*Habitat.*—Porto Bello, Alhajuela, and Taboga Island, Panama. March, April and June.

*Type-specimen.*—Cat. No. 16710, U.S.N.M.

The wing form and pattern places this species near *S. venatum* Busck.

### STENOMA VIVAX, new species.

Labial palpi light bluish gray, black toward the face. Antennæ dark gray. Face white, iridescent. Head lead gray with whitish side tufts. Thorax bluish gray with one central and two lateral large, contiguous, yellow spots and with four, smaller, black spots; patagina light saffron yellow. Forewings light pearly gray with all the veins clearly and thinly outlined in dark lead gray and with dorsal space below the fold shaded with the same darker color; extreme base of costa black; cilia white. Hindwings light gray with whitish cilia; abdomen light fuscous above. Entire underside of body silvery white. Legs white, shaded externally with gray; tarsi and spurs yellowish.

*Alar expanse.*—26 mm.

*Habitat.*—Cabima, Panama. May.

*Type-specimen.*—Cat. No. 16711, U.S.N.M.

A fine clear-cut species, which comes next to the group consisting of *renselariana* Stoll, *stigmatias* Walsingham, *ergates* Walsingham, *disjecta* Zeller, *loxogrammos* Zeller, *lacera* Zeller, and *venatum* Busck.

### STENOMA SAGAX, new species.

Labial palpi light gray, shaded with black toward the face. Antennæ golden fuscous. Face and head whitish. Thorax light golden ochreous with two yellow lateral spots and with posterior tip blackish; patagina yellow. Forewings light ochreous gray with the veins thinly outlined in dark lead gray and with entire dorsal half shaded with darker gray; the edge of the wing is golden ochreous and the extreme base of costa is black. Hindwings light ochreous fuscous with golden edges and cilia. Abdomen light fuscous above; underside of body silvery white. Legs ochreous white.

*Alar expanse.*—22–23 mm.

*Habitat.*—Porto Bello, Panama, May.

Bred from larvæ, feeding between the leaves of a small thorny palm.

*Type-specimen.*—Cat. No. 16712, U.S.N.M.

Very close to the foregoing species (*vivax*) and clearly the Atlantic representative of this Pacific species; but can readily be distinguished by its smaller size, more ochreous color and the less pronounced, though identical wing pattern.

### STENOMA FELIX, new species.

Labial palpi white, second joint shaded externally with brown; terminal joint mottled with brown and with extreme tip blackish brown. Antennæ dark olive brown. Face whitish. Head and thorax dark olive brown. Forewing lighter olive gray with the entire costal edge narrowly light ochreous; terminal edge with a series of nearly contiguous, white spots; from above the middle of costa to apical third of dorsum runs a narrow, oblique, broken, blackish brown fascia edged toward the base of the wing by a correspondingly irregular thin white line; on the middle of the cell is a dark brown dot continued faintly obliquely downward to a similar dot on the fold; cilia whitish. Hindwings dark olive fuscous. Abdomen dark fuscous above; underside silvery white. Legs white shaded above with dark fuscous.

*Alar expanse.*—18 mm.

*Habitat.*—Cabima, Panama, May.

*Type-specimen.*—Cat. No. 16713, U.S.N.M.

Very close to *S. aphanes* Walsingham, but of a clearer less ochreous gray color and lacking the outer and inner fasciæ of this species.

### STENOMA CHLORINA Kearfott.[1]

Labial palpi white, second joint with a broad anterior, longitudinal, greenish brown streak; terminal joint with a black anterior longitudinal line. Antennæ brown above, whitish on the underside. Face white. Head and thorax brownish olive green. Forewings with costa strongly and evenly arched from base to apex; termen rounded; dorsum straight; olive green with costal edge narrowly yellow; from the base of the wing parallel with the costal edge runs a thin, white line, which curves down and ends in an obscure ocelate white spot at the end of the cell; another faint white line runs below and parallel with the outer third of costal edge and a faint series of small white dots follow the terminal edge; cilia olive green. Hindwings light greenish fuscous. Abdomen and legs bright ochreous.

*Alar expanse.*—30 mm.

*Habitat.*—San Paulo, Brazil, and Porto Bello, Panama, May.

*Type-specimen.*—Cat. No. 16714, U.S.N.M.

Near to *S. aesiocopia* Walsingham, but larger, more green and without the blackish discal spot of this species.

### STENOMA LAMPYRIDELLA, new species.

Labial palpi light ochreous, outer side of second joint and tip of terminal joint shaded with fuscous. Face light bluish fuscous iridescent. Head dark bluish fuscous. Thorax light ochreous fuscous. Forewings elongate ovate; costa and dorsum nearly straight, apex and termen evenly rounded; dark mouse-gray with a yellowish tint and with costal edge and a longitudinal streak from base to apex through the middle of the wing ochreous; extreme base of costa black, below which the base of the wing is conspicuously reddish brown; base of the fold ochreous. Hindwing blackish fuscous. Abdomen blackish fuscous. Legs ochreous with black tarsi, on which are narrow ochreous annulations.

*Alar expanse.*—22 mm.

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[1] Ent. news, vol. 22, 1911, p. 126.

*Habitat.*—Cabima, Panama, May.

*Type-specimen.*—Cat. No. 16715, U.S.N.M.

Though produced by different means, the color effect and general appearance of this species is remarkably like that of *Costoma basirosella* Busck. and certain other *Lampyrid*-like Lepidoptera. (See p. 24.)

### STENOMA VIRIDIS, new species.

Second joint of labial palpi light ochreous on the inner side, reddish brown exteriorly; terminal joint whitish ochreous. Face dark brown with dark ochreous lateral margins. Head violaceous brown. Antennæ dark gray with whitish underside and with ochreous brown basal joints. Thorax light brown sparsely sprinkled with black and with posterior tip black. Basal half of the forewings light brown sprinkled with black, outer half light leaf green, sprinkled with single black scales; the limit between the green and the brown parts is sharp and begins at basal third of costal edge, whence it runs downwards and obliquely outwards to a sharp point below the end of the cell and from there down and back to the middle of dorsal edge; just before the tip of the brown projection into the green is a small, pure white spot; costal edge narrowly brown in its entire length; apical and terminal edges broadly brown; cilia brown. Hindwings dark fuscous on basal two thirds, light ochreous brown on outer third, cilia ochreous. Abdomen brown with ochreous anal tuft and white underside. Legs light ochreous.

*Alar expanse.*—23–25 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16716, U.S.N.M.

A specimen which undoubtedly belongs to this species from Tuis, Costa Rica, W. Schaus, collector, has the apical brown part much larger than the type, extending over entire apical fourth part of the wing and limiting the green part to a large boot-shaped spot. This and the following species are next to *S. speratum* Busck., and both are allied to *S. trochilosticta* Walsingham.

### STENOMA FRONDIFER, new species.

Second joint of labial palpi light brownish fuscous, whitish on the inner side; terminal joint whitish. Lower face light straw colored, upper face reddish brown. Head dark brownish fuscous. Antennæ dark fuscous with ochreous brown basal joints. Thorax dark fuscous with posterior tip black. Forewing dark brownish fuscous with a greenish tint and strongly mottled with transverse, black striations; at the end of the cell lies a large oblong leafgreen spot which is connected by a narrow neck with another similar, but perpendicular, oval spot at tornus; below the first of these spots is a small, pure, white dot as in the preceding species; cilia dark fuscous. Hindwings light fuscous, unicolored. Abdomen dark fuscous, with the first joints, underside, and anal tuft light ochreous. Legs light ochreous.

*Alar expanse.*—18 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16717, U.S.N.M.

Closely allied to the foregoing species but smaller, darker, more black mottled, and with the green area much smaller.

### STENOMA VIVIDELLA, new species.

Labial palpi white, sprinkled with black, second joint with a large basal black spot on the outside; terminal joint with a small black spot at base and a black annulation before the tip. Face whitish. Head white mixed with ochreous. Antennæ ochreous with narrow black annulations. Thorax ochreous, mixed with white and greenish scales. Forewings light ochreous with the larger costal and apical area white and green; the ochreous ground color occupies the dorsal part of the wing and sends a broad triangle upward, the tip of which nearly reaches the costal edge before the middle; this ochreous space is sprinkled with white and greenish scales and contains a large, ill-defined, light-green spot on the middle of the cell, in which is found a small deep black dot; base of costal edge alternately white and light green; from the middle of costa runs a broad outwardly oblique green streak down to middle of termen; this green streak contains a few, scattered, black scales and a larger, ill-defined aggregation of black scales near termen; above it the wing is white with two ill-defined green spots; across the middle of the wing and apical third are indistinct, transverse ridges of raised scales; cilia light ochreous with alternate black tipped, green and ochreous spaces on the basal half. Hindwing triangular, dark fuscous; cilia ochreous with a fuscous basal line. Abdomen light ochreous above, whitish on the underside. Legs whitish ochreous, heavily barred with blackish brown on their exterior side.

*Alar expanse.*—17–19 mm.

*Habitat.*—La Chorrera and Porto Bello, Panama. April, May.

*Type-specimen.*—Cat. No. 16718, U.S.N.M.

This species is allied to *S. lactis* Busck. Mr. Meyrick uses the generic name *Agriophara* Rosenstock, for this group, which includes *S. acronitis* Busck, *S. mendoron* Busck, *S. nestes* Busck, and *S. apicalis* Busck, on the character "more or less developed tufts or ridges of raised scales on the disk of the forewing," but this character is found in many species which can not be closely associated with the above, and I feel sure that the genus can not be maintained.

### STENOMA FENESTRA, new species.

Second joint of labial palpi light golden ochreous in front, white on the inner side and dark brown exteriorly; terminal joint dusky white. Face and head yellowish white, silvery. Thorax reddish brown with ochreous posterior tip; patagina blackish brown on lower half, tips light ochreous. Forewing dark violaceous brown; a round lemon yellow spot on costal edge near base, followed by a large reddish yellow spot, edged by dark velvety brown scales; a small yellow dot within the middle of the dorsal edge, some diffused reddish and dark-brown streaks on the cell; two indistinct and suffused, whitish, zigzag lines across the wing at apical third; extreme costal edge, a small spot at apical third of costa and extreme apex light yellow. Hindwing dark fuscous. Abdomen dark fuscous with white underside. Legs white; tarsi and anterior tibiæ barred with dark brown.

*Alar expanse.*—22 mm.

*Habitat.*—Chiriquicito, Panama; Sixola River, Costa Rica, W. Schaus, collector.

*Type-specimen.*—Cat. No. 16719, U.S.N.M.

Nearest to *S. apicalis* Busck, which species was also taken in Panama, at Cabima, June.

### STENOMA PHYTOPTERA, new species.

Second joint of labial palpi dark violaceous brown, strongly mixed with light ochreous toward the tip; terminal joint light yellow, with dark violaceous brown base and annulation before the tip. Face light straw yellow. Head dark ochreous mixed with brown. Thorax dark violaceous brown with posterior lobe leaf green. Forewing dark violaceous brown, irregularly mottled with leaf-green scales, a large blotch of which is found just before the middle of dorsum, followed by a black dot on the fold; at the end of the cell is a short, transverse, black line; on the middle of the edge is a large showy dark velvety brown spot with a pure white center and with deep black shadings in front, and with four or five black dashes toward the margin; cilia dark brown with small equidistant pencils of light ochreous. Hindwings blackish fuscous. Abdomen blackish brown; underside mixed with ochreous. Legs blackish brown; tarsi with narrow ochreous annulations.

*Alar expanse.*—25–27 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16720, U.S.N.M.

I also have this showy species from Sixola River, Costa Rica, W. Schaus, collector. Though of quite different ornamentation, it falls in the same group as the preceding species.

### STENOMA FUMIPENNIS, new species.

Labial palpi dark gray; inner side of second joint, base and extreme tip of terminal joint white. Lower face white; upper face, head, and thorax dark gray with a greenish and violet metallic sheen. Forewings dark gray; a small, triangular, whitish ochreous spot just before the middle of costa is bordered by two ill-defined, dark green, metallic spots; dorsal part of the wing below the fold strongly suffused with dark green metallic scales; at the end of the cell is a whitish ochreous, ill-defined cloud with a small green center, from which a metallic green spur runs down to the end of the fold; at apical third and just before terminal edge are two faint, whitish lines across the wing; the dark space between these lines is strongly suffused with green metallic scales; the entire wing when looked at toward the light is brilliant iridescent green, while away from the light the gray appears dull and the green appears blackish; cilia dark gray. Hindwing blackish fuscous. Abdomen blackish fuscous with two, lateral, whitish, longitudinal streaks. Legs silvery white on their inner sides; dark gray exteriorly.

*Alar expanse.*—22–25 mm.

*Habitat.*—Alhajuela and Trinidad River, Panama, March.

In the United States National Museum are specimens also from St. Jean, French Guiana, Sixola River, Costa Rica, and Aroa, Venezuela, W. Schaus, collector.

*Type-specimen.*—Cat. No. 16725, U.S.N.M.

A brilliant iridescent form allied to the foregoing species.

### STENOMA BASILARIS, new species.

Labial palpi dark olive brown with apex of second joint and a thin streak on inner side of both joints white. Lower face white, upper face and head dark gray. Thorax dark gray with blackish patagina. Forewings white, overlaid with dark and light gray on dorsal half, costal half mostly white; base of costal edge and a short streak at costal fourth black; a small black streak on costa at apical third; a prominent, oval, black spot at the end of the cell, followed by a very irregular and inconspicuous, blackish, zigzag line across the wing; at apical fourth is a narrow white transverse fascia; around apical and terminal edges a marginal series of blackish brown dots; cilia dirty white. Hindwings light fuscous with the apical cilia white. Abdomen light fuscous with the white underside and light yellow anal tuft. Legs white sprinkled exteriorly with light brown scales.

*Alar expanse.*—16–18 mm.

*Habitat.*—Alhajuela, Porto Bello, and Trinidad River, Panama, March, April.

*Type-specimen.*—Cat. No. 16721, U.S.N.M.

A well-marked species of the *Schlaegeri* group, recognizable by its prominent black discal spot and the black inner angle of the forewing.

### STENOMA DISCALIS, new species.

Labial palpi blackish fuscous with whitish inner surface. Face dark fuscous with lower edge white. Head yellowish white. Thorax yellowish white, central part shaded with fuscous, anal lobe dark fuscous; patagina yellowish white. Forewing yellowish white with dorsal half suffused with light gray; a small, blackish costal spot at basal fourth; another at apical fourth, and one at apex; a small dark brown spot at basal fourth of dorsum; cilia yellowish white. Hindwings light fuscous with yellowish white cilia and in the males with a white hairpencil at base of costa. Abdomen fuscous with white underside and yellowish anal tuft. Legs white with dusky tarsi; anterior tibiæ and tarsi black in front.

*Alar expanse.*—20 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16722, U.S.N.M.

Closely related to *S. basilaris*, but slightly larger and without the discal and dorsal black spots.

### STENOMA MITRATELLA, new species.

Second joint of labial palpi light ochreous brown exteriorly, blackish at base; inner side white; terminal joint white, faintly sprinkled with light brown. Face and head pure white. Thorax dark fuscous with bluish black anal lobe; patagina light ochreous fuscous. Forewings white, heavily overlaid with light ochreous fuscous except on costal part, which is pure white, and an ill-defined streak from base along the lower edge of the cell, where the white scales predominate; at the end of the cell is a short, transverse, blackish brown streak; from apical third of costa runs an outwardly curved, dark fuscous, ill-defined line across the wing; at basal third of dorsal edge is a conspicuous tuft of light ochreous brown, raised scales; cilia light fuscous. Hindwing light fuscous with whitish top and apical cilia. Abdomen light fuscous above, underside white. Legs white with tarsi and anterior tibiæ brown.

*Alar expanse.*—23 mm.

*Habitat.*—Porto Bello, Panama, April.

*Type-specimen.*—Cat. No. 16723, U.S.N.M.

Easily recognized in the *Antæotricha* group by the ochreous brown dorsal tuft.

### STENOMA PLUMOSA, new species.

Labial palpi yellowish white; second joint externally barred with light yellow and blackish brown; terminal joint with extreme base and a broad annulation before the tip blackish brown. Face light yellowish fuscous. Head and thorax light yellowish brown. Forewing yellowish brown with violaecous sheen; a dark brown line from base along base of dorsum, another similarly colored, zigzag line obliquely across the cell to the middle of dorsum; a dark brown, nearly straight, line from middle of costa at tornus and an outwardly curved, dark brown line from apical fourth to tornus; a marginal series of black dots around apex; cilia light ochreous; the male has a costal fold, from which expands a large heavy tuft of stiff, light ochreous hairs, half as long as the forewings. Hindwing light yellow fuscous, in the male with a light yellow costal hair pencil. Abdomen dark fuscous. Legs yellowish white.

*Alar expanse*.—15 mm.

*Habitat*.—Trinidad River, Panama, March.

*Type-specimen*.—Cat. No. 16724, U.S.N.M.

Superficially mistakable for the somewhat smaller *Zetesima lasia* Walsingham, which also has a costal fold and tuft on the forewing, but the present species has normal *Stenoma* venation.

### STENOMA STRIATELLA, new species.

Labial palpi white; second joint shaded with dark fuscous externally toward base; terminal joint dusky toward the tip. Face pure white, silvery. Head white with center of tuft gray. Antennæ dark fuscous with white base. Thorax dark brownish gray with whitish patagina and posterior tip. Forewings white; the dorsal two-thirds heavily overlaid with dark gray and sprinkled with darker, blackish brown, short, longitudinal dashes, of which a few also occur in the pure white costal third; three short, outwardly oblique, dark brown costal streaks, one at basal fourth, one on the middle of costa, and one at apical fifth; a submarginal series of black streaks around apical and terminal edge; cilia white. Hindwings dark fuscous with lighter cilia. Abdomen dark fuscous with lighter whitish underside and anal tuft. Legs white with dusky tarsi.

*Altar expanse*.—14–16 mm.

*Habitat*.—Trinidad River and Alhajuela, Panama, March, April.

*Type-specimen*.—Cat. No. 16726, U.S.N.M.

### STENOMA PALLULELLA, new species.

Labial palpi dark gray with inner side and tip of second joint whitish. Lower face white, upper face dark gray. Head and thorax dark brownish fuscous. Forewing with a large, blackish brown, basal area, reaching to basal third of costa and to the middle of dorsum;

this space is liberally sprinkled with golden ochreous scales, especially on the two margins, and with scattered white scales; on the dorsal side this space is continued into a lighter dark gray space on the middle of dorsum; a large quadrangular space on the middle of costa and reaching down to the middle of the cell milky white, with a white ill-defined spur down to basal fourth of dorsum; in this white space is a black transverse spot at the end of the cell and an indistinct, black, zigzag line in the outer part; apical third of the wing blackish brown with a diffused line of white across the wing and with a series of white terminal dots; cilia dark brown. Hindwing blackish brown with white costal area and in the male with a white costal hair pencil. Abdomen blackish fuscous with ochreous anal tuft. Legs light gray externally, white on the inner side; tarsi golden on the underside.

*Alar expanse.*—20–22 mm.

*Habitat.*—Trinidad River, Panama, March. Also a specimen from Turrialba, Costa Rica, W. Schaus, collector.

*Type-specimen.*—Cat. No. 16727, U.S.N.M.

A very dark species of the *Antaeotricha* group, distinguished by the very dark hindwing and the white costal hair pencil in the male.

### STENOMA CARBONIFER, new species.

Second joint of labial palpi rich dark brown exteriorly, whitish on the inner side and at tip; terminal joint white. Face and head milky white. Anterior edge of thorax and base of patagina white; tip of patagina and the larger posterior part of thorax black, with a bluish metallic sheen. Forewing light ochreous clouded with brown, with a large, dorsal, evenly rounded patch of black scales, at base of which some are more or less erect; above and bordering this black space is a small patch of brown scales; three dark brown costal spots, one at basal third, one on the middle, and one at apical fourth, from the latter starts an indistinct, outwardly curved, row of small brown dots across the wing to termen; a faint row of brown marginal dots along terminal edge; a small black dot at the end of the cell; cilia dark fuscous. Hindwings light yellowish fuscous with yellowish cilia. Abdomen dark fuscous above; underside light ochreous. Legs whitish ochreous; forelegs with dark fuscous outer side of tibiæ and tarsi.

*Alar expanse.*—19–23 mm.

*Habitat.*—Porto Bello, and Corozal, Panama. Specimens also from St. Jean, French Guiana, and from Tuis, Costa Rica, W. Schaus, collector.

*Type-specimen.*—Cat. No. 16728, U.S.N.M.

Intermediate between the foregoing *Antaeotricha* group and the genus *Gonioterma*, in wing form and coloration. Vein 8 of forewing to apex.

### STENOMA MARGINATA, new species.

Labial palpi bright ochreous; second joint shaded with dark fuscous exteriorly; terminal joint with base and an annulation above the middle dark fuscous. Face light golden yellow. Head, anterior part of thorax and patagina, and costal edge of the forewings bright ochreous; thorax and patagina otherwise dark purplish brown. Forewings elongate ovate; apex and termen rounded, purplish brown, with a black dot at the end of the cell, another on the middle of the fold, and a marginal series of black dots around the apical and terminal edges; cilia ochreous fuscous. Hindwings dark purplish fuscous with the costal part, which is covered by the forewings, white. Abdomen dark purplish brown above, with light ochreous underside. Legs light ochreous, barred, and annulated with dark fuscous.

*Alar expanse.*—16 mm.

*Habitat.*—Cabima and Trinidad River, Panama, March and May.

*Type-specimen.*—Cat. No. 16729, U.S.N.M.

Very similar in color and ornamentation to the somewhat smaller *Cryptolechia epidesma* Walsingham.

### STENOMA SIMPLEX, new species.

Second joint of labial palpi white, shaded with dark fuscous exteriorly and with a dark spot on the inner side near apex; terminal joint dark fuscous, with posterior edge white. Face white. Head and thorax dark violaceous brown. Forewing dark brown, nearly black, with a violaceous sheen; extreme costal edge narrowly white; a thin, white, broken, zigzag line across the wing from the middle of costa over the end of the cell to apical third of dorsum, but not quite reaching the dorsal edge; a small white spot with a black center at apex; a faint row of small white dots along terminal edge; upper part of cilia around apex white, lower part blackish brown. Hindwing blackish brown, with apical cilia whitish. Legs dark brown externally, pure silvery white on the inner side. Underside of body white.

*Alar expanse.*—14–15 mm.

*Habitat.*—Trinidad River, Panama, June.

*Type-specimen.*—Cat. No. 16738, U.S.N.M.

Very close to *S. menestella* Walsingham, *S. filiferella* Walker, and *S. nivilliturella* Walker, but somewhat larger than any of these, nearer in size to the also closely allied *S. ochropa* Walsingham.

### STENOMA MINOR, new species.

Labial palpi silvery white, shaded externally with blackish fuscous. Face pure silvery white. Head blackish brown. Thorax blackish brown, with a bluish metallic sheen. Forewings dark purplish brown, with strong metallic reflections; costal edge at apical fourth touched with white; cilia light straw yellow, with a basal series of dark brown spots. Hindwing dark brown. Abdomen above dark purplish brown, with gray anal tuft and silvery white underside. Legs silvery white.

*Alar expanse.*—8 mm.

*Habitat.*—Trinidad River and Porto Bello, Panama, March and May.

*Type-specimen.*—Cat. No. 16730, U.S.N.M.

Reminding superficially very much of our North American species of *Menesta*. The type of this species has vein 2 and 3 in the forewing short stalked.

### STENOMA LEUCOTHEA, new species.

Labial palpi pale rosy ochreous on the inner side, brown on the outer side. Face and head rosy ochreous. Thorax rosy ochreous, with a central and posterior ridge of raised reddish brown scales. Forewings pale ochreous gray; costal edge narrowly bright terra cotta; dorsal edge narrowly bright ochreous brown; a large, oval, light yellow spot at the end of the cell, edged posteriorly with dark ochreous; an outwardly curved transverse row of small blackish brown dots from apical third of costa across the wing; a similar, parallel, but fainter and not so complete, row of dark-brown scales from the middle of costa touches the yellow spot; a still fainter and less complete line of dots at basal third; cilia rosy ochreous. Hindwings light ochreous fuscous. Abdomen light fuscous above, pale yellow on the underside. Legs light ochreous, with dusky tarsi.

*Alar expanse.*—20 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16735, U.S.N.M.

A very delicately tinted species, readily recognized by the darker, bright-colored edges of the forewings.

### STENOMA BOVINELLA, new species.

Second joint of labial palpi light rose colored on the inner side, ochreous brown exteriorly; terminal joint light ochreous brown. Lower face white; upper face light ochreous brown. Head reddish brown. Thorax light brown. Forewings light brown with costal edge narrowly vivid brick red; from the middle of costa to basal angle of dorsum runs a darker, blackish brown, nearly straight line; from apical fourth of costa to apical fourth of dorsum runs an outwardly evenly curved, blackish brown line; at the end of the cell is a circlet of blackish brown scales, enclosing a brown area, which is slightly lighter than the rest of the wing; a few scattered blackish brown scales on all parts of the wing; cilia light rose colored. Hindwings light ochreous with the cilia touched with rose at the apex. Abdomen light brown above; light ochreous on the underside. Legs light ochreous with tarsi light brown externally.

*Alar expanse.*—19 mm.

*Habitat.*—Paraiso and Corozal, Panama, June.

*Type-specimen.*—Cat. No. 16736, U.S.N.M.

This species may be placed next to the *S. tristrigata* Zeller group, from which it differs in the smaller size and the inwardly directed dark line on forewings.

### STENOMA AFFIRMATELLA, new species.

Labial palpi light bluish gray; second joint blackish brown exteriorly; terminal joint with a blackish brown longitudinal line in front. Face dark lead colored. Head light, whitish gray, loose scaled. Thorax dark bluish gray. Forewings light bluish gray; the ground color is really dirty white but is so evenly and closely overlaid with bluish fuscous scales as to give the impression of an even color to the naked eye; three complete, broad, blackish fuscous lines run obliquely across the wing, the first from basal fourth of costa to the middle of dorsum, the second from the middle of costa to just before tornus; these two are tolerably straight and nearly parallel; the third line runs from apical fourth of costa to tornus and is outwardly curved and sinuated; a series of small, black, equidistant marginal dots around apex and termen; cilia light gray. Hindwing light ochreous fuscous. Abdomen dark fuscous above, silvery white on the underside. Legs white, barred exteriorly with dark fuscous.

*Alar expanse.*—19 mm.

*Habitat.*—Paraiso, Panama, June.

*Type-specimen.*—Cat. No. 16737, U.S.N.M.

Allied to *S. liniella* Busck, but much smaller and lighter in color.

## Genus GONIOTERMA Walsingham

*Type.*—*Gonioterma burmanniana* Cramer.

### GONIOTERMA IMPRESSELLA, new species.

Labial palpi dark brown on the outer side; inner side and terminal joint reddish ochreous. Antennæ dark olive brown. Face dark brown; head and patagina light reddish brown; thorax dark blackish brown. Forewings with costa nearly straight; apex pronounced but rounded; termen perpendicular; tornus pronounced; dorsum slightly concave; light reddish brown with a violet tinge, shaded with rich dark brown; at the base of costa is a large dark brown area reaching down to the fold; from basal third of costa runs an oblique dark brown line across the wing to apical third of dorsum, edged basally with ochreous scales; at the end of the cell is a short, perpendicular, brown streak; outer half of costal area dark brown; from just before apex runs a dark brown line across the wing, nearly meeting the other crossline at right angles on dorsal edge; cilia reddish ochreous with dark brown basal line. Hindwing bright golden ochreous with a reddish tinge toward apex. Abdomen light ochreous with light red tip. Legs light ochreous; tarsi dark brown.

*Alar expanse.*—21–25 mm.

*Habitat.*—Cabima and Trinidad River, Panama, May.

In the United States National Museum is also a specimen from St. Jean, Maroni, French Guiana, W. Schaus, collector.

*Type-specimen.*—Cat. No. 16739, U.S.N.M.

A very showy species when fresh; rubbed specimens lose much of the brilliancy and appear simply brown with a darker brown cross-line and with light yellow hindwings.

### GONIOTERMA GERDA, new species.

Labial palpi light clay yellow, with exterior side of second joint blackish brown. Face and head light clay yellow. Thorax light yellowish brown. Forewing light yellowish brown with costal and terminal edges narrowly light yellow; on the middle of the fold is a small black dot; at the end of the cell is a similar black dot; from apical fourth of costa runs a faint darker brown line across the wing to dorsum; this line is sharply inwardly bent just below costa, thence evenly outwardly curved, terminating just before the beginning of the cilia; cilia dark yellowish fuscous. Hindwing yellowish fuscous with narrow yellow edge and light yellowish cilia. Abdomen light yellowish brown with whitish yellow underside. Legs yellow, anterior tibiæ and tarsi marked with blackish brown; posterior tarsi light brown.

*Alar expanse.*—29 mm.

*Habitat.*—Porto Bello, Panama, April.

*Type-specimen.*—Cat. No. 16740, U.S.N.M.

Very close to *S. emma* Busck, slightly larger and with more rounded terminal edge in the forewing; at once distinguished from this species by the lighter hindwing and the absence of the costal spot on the forewings.

### GONIOTERMA MINNA, new species.

Second joint of labial palpi bluish white on the inner side, light golden brown in front and dark brown exteriorly; terminal joint white. Lower face light violaceous; upper face iridescent white. Head and thorax light purplish brown. Forewing light purplish fuscous; extreme costal edge golden yellow; two triangular dark purple costal spots, one on the middle of costa, one somewhat larger at apical fourth extended nearly to apex; just before apex a small, bright ochreous spot; from the two costal spots run very faint, outwardly strongly angulated lines of dark purple dots across the wing; a faint dark streak also from basal third of costa; base of costa slightly darker; a faint dark purple first and second discal dot; from the base of dorsal edge runs a slightly curved dark purplish brown streak longitudinally across the fold and terminating just below the second discal spot at the end of the cell; terminal edge dark brown; cilia dark purple. Hindwing dark golden fuscous with yellowish purple cilia; the males have a strong yellowish costal tuft of long sense hairs from base of the hindwings. Abdomen fuscous with lighter underside. Legs light ochreous with darker brown tarsi.

*Alar expanse.*—22–23 mm.

*Habitat.*—Porto Bello and Alhajuela, Panama, March.

*Type-specimen.*—Cat. No. 16741, U.S.N.M.

Differs from all species in this genus known to me by the longitudinal dark streak from base of dorsal edge to the end of the cell.

### GONIOTERMA CORA, new species.

Labial palpi dark bluish brown with base and inner side whitish. Lower edge of the face and the tongue silvery white; upper face, head, and thorax dark brown. Forewings dark brown with a purplish sheen and with indistinct, darker blackish brown markings; from the blackish brown costal edge run three thin, irregular, zigzag lines of the same color across the wing; one from basal third of costa to middle of dorsum, one from middle of costa to apical third of dorsum, and one from apical third of costa to tornus; a very faint row of small blackish brown dots along termen; cilia dark purplish brown. Hindwing dark fuscous. Abdomen dark brown above, light ochreous on the underside. Legs silvery ochreous, shaded with dark brown exteriorly.

*Alar expanse.*—22 mm.

*Habitat.*—Trinidàd River, Alhajuela and Porto Bello, Panama, April, May.

*Type-specimen.*—Cat. No. 16742, U.S.N.M.

Nearest to the foregoing species but with darker head and without any costal spot or longitudinal line.

## Family SPARGANOTHIDÆ.

### Genus HOMONA Walker.

*Type.*—*Homona coffearia* Nietner.

### HOMONA AQUILA, new species.

*Male.*—Labial palpi saffron yellow. Face and head bright saffron. Thorax brownish ochreous. Forewings arched at base; costa depressed beyond the middle; termen sinuate below apex; basal third light ochreous, reticulated with brown lines; rest of the wing, except a small ochreous, reticulated area on termen, suffused with dark brown, in which two irregular, outwardly curved, darker brown fasciae are barely discernible, one from just before middle of costa, the other from apical fifth; entire wing sparsely speckled with small black atoms tending to form transverse striation; cilia concolorous with the dark brown part of the wing. Hindwing dark brownish fuscous, much darker than the forewings, with apex and terminal edge broadly mottled with brown and black. Underside of both wings light ochreous, mottled with dark fuscous, transverse striation. Abdomen dark fuscous above, underside light ochreous with a longitudinal row of three deep black spots; male genital tufts blackish fuscous.

*Alar expanse.*—34 mm.

*Habitat.*—Cabima, Panama, May.

*Type-specimen.*—Cat. No. 16743, U.S.N.M.

Very similar in wingshape and ornamentation to *Homona sebasta*, Walsingham, but somewhat larger and distinguished from all described species in the genus by the very dark hindwings and abdomen. The longitudinal row of black spots on the underside of the abdomen is common to all the species of the genus known to me.

### HOMONA CONSOBRINA, new species.

*Female.*—Labial palpi light saffron yellow mottled with dark red. Face and head light ochreous with a dark red, transverse line below the antennæ; collar reddish brown. Thorax and patagina light violaceous brown. Forewing with base of costa strongly arched and middle of costa depressed; apex prominent; termen strongly sinuated below apex and strongly convex on the lower part; light brown, clouded with darker brown and evenly sprinkled with blackish brown dots, which tend toward transverse striation; costal edge from before middle to apex broadly white, which color gradually mixes with the brown color of the wing; base of costal edge narrowly dark reddish brown; cilia dark mahogany brown strongly contrasting with the lighter brown scaling. Hindwings reddish brown, with white costal area and with faint, blackish brown, irregular, transverse spots. Underside of forewing reddish brown with apical part lighter ochreous, and sprinkled with brown, transverse striation. Underside of hindwing light ochreous with brown, transverse striations; three round black dots in a longitudinal row between veins 5 and 6 and scattered black dots at the base of the light ochreous cilia. Abdomen light brown; underside ochreous with the usual row of black spots; terminal joint on the underside with a large cushion of peculiar, erect, thickened scales, such as are found in the females of all the American species. Legs ochreous; tarsi marked with dark brown.

*Alar expanse.*—32 mm.

*Habitat.*—Porto Bello, Panama, May.

*Type-specimen.*—Cat. No. 16744, U.S.N.M.

Closely allied to *H. patulana* Walker, but somewhat larger and darker and at once separated by the dark hindwings, which, however, are not as dark as those of *H. aquila* Busck.

## Family HEMEROPHILIDÆ.

### Genus HEMEROPHILA Hübner.

*Type.—Hemerophila albertiana* Stoll.

**HEMEROPHILA LACINIOSELLA, new species.**

Labial palpi golden fuscous. Face and head dark purplish brown. Antennæ dark brown dotted on the upper side with silvery white. Thorax dark brown, finely sprinkled with ochreous white atoms. Forewings dark brown, finely but irregularly mottled with ochreous white dots; on the outer half sparsely sprinkled with single black scales; just before the middle is a transverse, slightly convex fascia, reddish brown on its costal half, dark brown on its dorsal half; apical corner of the wing bright golden yellow, with extreme apical and terminal edge deep black and with metallic blue angulated line, parallel with the edge; this angulated line is bordered on the inner side by a similarly angulated black line; all these markings cover only the upper two-thirds of termen; cilia coppery fuscous with strong metallic reflections. Hindwings and cilia dull dark brown with a whitish marginal line. Abdomen dark brown with broad, transverse, silvery white bands on the underside. Legs dark brown with broad silvery white annulations.

*Alar expanse.*—14 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16756, U.S.N.M.

Near to *H. contrariana* Walker, but without the golden yellow, zigzag line on outer half of the forewing and differing also in the more elaborately ornamented apical corner.

**HEMEROPHILA MERATELLA, new species.**

Labial palpi whitish with dusky tip. Face and head dark brown. Antennæ blackish brown with silvery annulations. Thorax dark brown with two broad, lateral, whitish brown streaks. Forewings with pointed, slightly produced apex; dark brown, finely sprinkled with ochreous white atoms; a broad, unsprinkled, reddish brown fascia just before the middle; the outer edge of this fascia is slightly convex and is well defined by the more condensed white dusting outside; the inner edge is not so clearly defined, the white dusting encroaching somewhat upon the fascia; beyond the fascia the ground color of the wing becomes more purplish; before apex is a large, round, reddish-ochreous spot, traversed longitudinally on its lower half by a pointed and uneven purplish prominence from the ground-color; extreme terminal edge deep black; inside of this is a broad, marginal, ochreous streak, which is bent at the apex and continued along outer fifth of costal edge; the ochreous line is edged interiorly by a thin, bluish silvery line, which is in turn broadly edged by black on its inner side; cilia bluish fuscous, with strong metallic reflections. Hindwing with apex unusually sharply pointed and prominent; clear, light reddish ochreous with extreme base and a small, ill-defined spot on the middle of termen dark fuscous; cilia dark fuscous, with metallic sheen. Abdomen brown, underside transversely banded with silvery white; underside of body silvery white. Legs silvery white, with broad, dark brown bars on the outer side.

*Alar expanse.*—15 mm.

*Habitat.*—Trinidad River, Panama, March.

*Type-specimen.*—Cat. No. 16757, U.S.N.M.

Forewing very similar in color and pattern to those of *H. contrariana* Walker, but the bright ochreous hindwing places the species near to *H. huituinalis* Cramer (*pulsana* Walker).

### Genus JONACA Walker.

*Type.*—*Jonaca compulsana* Walker.

Though Walker's generic descriptions are entirely inadequate for present day requirements and though my generic notes on the type of his genus *Jonaca*, made several years ago, are unfortunately not full enough for absolute determination, I feel reasonably safe in applying this name to the following species, which has the general habitus of the type of the genus. Below are given the generic characters of the present species, which I believe also apply to the type of the genus, *J. compulsana* Walker; a cursory examination of the type of this species in the British Museum will easily determine this. Labial palpi curved, ascending, hardly reaching vertex; second joint somewhat thickened with appressed scales; terminal joint short, bluntly pointed. Face, head, and thorax smooth. Antennæ short, stout, simple. Forewing with costa nearly straight, slightly deflected from apical third; apex blunt; termen rounded; tornus rounded; dorsum straight; cilia short; 12 veins, all separate; 2 from near end of cell; 3, 4, 5, equidistant, approximate from end of cell; 7 to termen; 11 from the middle of the cell; no secondary cell; 1*b* furcate at base. Hindwing broader than the forewing, roughly triangular with rounded apex; 8 veins; 3 and 4 connate; 5, 6, and 7 parallel. Posterior tibiæ with short tufts of hair above the spurs. Body stout.

Allied to *Rhobonda* Walker, which differs in having an internal vein in the cell, vein 11 from near the base and vein 2 from near the middle of the cell.

### JONACA OLIVACEA, new species.

Second joint of labial palpi ochreous white, with a broad blackish brown band just before the apex; terminal joint with the extreme tip ochreous white. Face blackish brown, with a few scattered ochreous scales. Head and thorax dark olive brown; patagina olive, with whitish tips. Basal fourth of forewing greenish brown; the rest of the wing is deep blackish brown, nearly black except for a large, light ochreous, costal spot at apical third and a similar, duller, opposite dorsal spot, which, together form a nearly complete, broad, light fascia across the wing; this light fascia is poorly defined outwardly, and the light color is somewhat diffused over the apical part of the wing, which is otherwise blackish brown; cilia blackish brown. Hindwing deep blackish brown, nearly black, with a large spot on the upper part of the cell ochreous white, a small spot following this golden ochreous, and with costal area white; the short cilia is pure white. Underside of forewings black, with a large golden yellow spot on the base of the apical veins; underside of the hindwings black, a large yellow costal spot at apical third and with the white semi-transparent spot of the upper side showing through. Abdomen above black, each segment posteriorly edged with white; last segment all black; underside of body ochreous white, slightly sprinkled with black scales. Legs whitish ochreous, broadly barred with black exteriorly; tarsal joint black with narrow golden annulations.

*Alar expanse.*—15–18 mm.

*Habitat.*—Cabima, Trinidad River, La Chorrera, and Taboga Island, Panama, January to June.

*Type-specimen.*—Cat. No. 16758, U.S.N.M.

## Genus TORTYRA Walker.

*Type.*—*Tortyra spectabilis* Walker.

### TORTYRA CUPRINELLA, new species.

Second joint of labial palpi violaceous silvery; terminal joint dark purple. Face violaceous silvery. Head dark metallic blue. Antennæ with the thickened basal part deep blue, a white annulation beyond it and tips gray. Thorax and patagina light bluish gray; thorax with two, dark purplish brown, lateral streaks. Extreme base of forewings silvery, followed by a short, oblique, blackish brown, costal streak and a similar, dorsal streak; basal two-thirds of the forewings dark brown, finely and evenly stippled with white dots, with the effect of a fine, white, transverse grain; at basal third is a transverse, bluish silvery fascia, of even width throughout, but slightly convex and broadly edged with blackish brown; terminal third of the wing strongly metallic, dark coppery with violet and blue reflections; the limit between this part and the basal grained part of the wing is oblique and rather sharply drawn from apical fourth of costal to shortly after the middle of dorsum; costal edge from apical third to apex dark greenish brown, unmottled; cilia light violaceous fuscous, with strong, iridescent, metallic luster. Hindwings dark olive brown, with light violaceous, iridescent cilia. Abdomen dark olive brown; underside of body silvery brown. Legs light violaceous brown, barred with dark brown; first tarsal joints with large white spots above.

*Alar expanse.*—14–15 mm.

*Habitat.*—Cabima and Porto Bello, Panama, March and June.

*Type-specimen.*—Cat. No. 16759, U.S.N.M.

This species is close to *T. fulgens* Felder and Rogenhofer, but differs in the two-colored thorax, the black basal streaks, the absence of metallic purple on basal third of the wing and the much lighter silvery fasciæ.

### TORTYRA FERRATELLA, new species.

Labial palpi whitish gray. Face iridescent, bluish silvery. Head deep metallic green. Antennæ with thickened basal two-thirds deep metallic blue; a broad white annulation at apical third; tip dark brown. Thorax light silvery fuscous with two, broad, dark blue, lateral streaks. Forewings with the dark brown ground color irrorated and obscured by closely set whitish ochreous stippling, which forms fine transverse lines; just before the middle of the wing is a broad fascia of light steel colored scales, not very different from the stippling on both sides except in their luster; the fascia is markedly broader on the dorsal side than on the costal side and is edged with two, broad, blackish brown, transverse lines of which the outer is the broadest and nearly straight, while the basal one is irregularly undulating and as a whole slightly convex; across the base of the wing runs an oblique, interrupted, dark brown streak, and extreme base of costal edge is black; terminal part of the wing dark metallic blue, irrorated with gold and with a broad, golden, longitudinal streak at tornus; in the outer part of the whitish stippled part of the wing run several, spreading, longitudinal, deep black lines, mainly along the veins; apical fourth of costa dark unmottled brown; cilia dark brown with strong ferruginous sheen. Hindwing dark purplish brown with light steel colored cilia. Abdomen dark silvery fuscous. Underside of entire body silvery white. Legs silvery white with blackish brown bars and last tarsal joints blackish brown.

*Alar expanse.*—15 mm.

*Habitat.*—Paraiso, Panama, January.

*Type-specimen.*—Cat. No. 16760, U.S.N.M.

Belongs to the group of *auriferalis* Walker and *spectabilis* Walker, but differs from both by the black longitudinal striation, as well as by the more subdued coloration, especially of the fasciæ.

## Genus PORPE Hübner.

*Type.—Porpe bjerkandrella* Thunberg.

### PORPE LAMELLA, new species.

Tuft on second joint of labial palpi black with base and a ring near apex light ochreous; terminal joint light ochreous with a broad, longitudinal, black streak in front. Face light ochreous. Head blackish brown with a central and two lateral, longitudinal, light red stripes. Forewings blackish brown on basal half, light reddish brown on outer half; in the black basal half are three longitudinal red lines, one on the middle of the wing from base to basal third, one above and one below this, beginning a little farther out and reaching to the reddish brown apical area; there are, besides, in the reddish black area one red, outwardly oblique, costal streak near base and two bluish metallic, outwardly oblique, costal streaks farther out, with a small red dash between them; also one large, outwardly oblique, bluish metallic dorsal streak reaching from the middle of dorsum to the end of the cell, where it is edged exteriorly by a deep black spot in the reddish apical area; in the apical part of the wing are three dorsal and three costal bluish metallic streaks, all more or less bordered with black; a black line along the terminal margin; cilia reddish brown. Hindwings blackish brown. Abdomen dark fuscous with broad, transverse bands on the underside. Underside of body and legs broadly, transversely banded with light reddish ochreous and black.

*Alar expanse.*—12–15 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16761, U.S.N.M.

Differs in the longitudinal markings from other species of the genus, of which it is otherwise typical, though rather narrow winged.

## Genus USSARA Walker.

*Type.— Ussara decoratella* Walker.

### USSARA EURYTHMIELLA, new species.

Second joint of labial palpi light yellow; terminal joint darker golden yellow. Face and head light yellow. Thorax light yellow with two broad, longitudinal, brown stripes uniting at the posterior end; patagina brown with a light yellow basal stripe. Forewings reddish brown with two prominent, light yellow, basal streaks; one on the middle of the wing from base, slightly upwardly curved, terminating abruptly at basal third; the other, broader, on base of dorsal edge also terminating abruptly at basal third; the two streaks are nowhere connected; just before the middle of the wing is a straight, perpendicular, bluish metallic fascia, followed by a short costal and a smaller dorsal light yellow dash; at the end of the cell is a short, bluish metallic transverse streak broadly edged with black and above it is a short, bluish metallic costal streak; beyond the end of the cell is an oval black patch traversed by fine, longitudinal, white lines and dashes; two light yellow costal dashes just before and in the cilia, preceded by small metallic spots; a broad, curved, interrupted, bluish metallic band around the termen edged on both sides with black; cilia light purplish with a yellow dash emphasizing the emargination of the wing. Underside of forewing dark purplish brown with the two apical yellow dashes equally prominent as on the underside. Hindwings dark purplish brown with light purplish cilia. Abdomen blackish brown with light yellow, transverse bands on the upper side. Anterior legs concolorous with the palpi, golden yellow; posterior legs light yellow with broad, blackish brown annulations.

*Alar expanse.*—10 mm.

*Habitat.*—Porto Bello, Panama, April.

*Type-specimen.*—Cat. No. 16762, U.S.N.M.

Very similar to the type of the genus in color and pattern, but smaller and differing in details, by the black, white-striped, oval patch beyond the cell and by the two basal yellow streaks being separate.

### USSARA EUMITRELLA, new species.

Labial palpi with terminal joint even more flattened than in the other species of the genus; black, with two thin, longitudinal, yellow stripes. Face and head black. Thorax black with a small yellow dot at posterior tip. Forewings black on basal part and on a large round area within tornus; elsewhere dark golden ochreous; the black basal part covers about a third of the wing and contains at basal fourth a large, light yellow, pointed, dorsal streak which reaches beyond the middle of the wing; the reddish ochreous part of the wing contains six small, bluish metallic, black edged, costal streaks, one terminal metallic streak below apex and two larger, dorsal, metallic streaks between and edging the two black fields; at the end of the cell is a bluish metallic round spot; cilia blackish brown. Hindwing blackish brown. Abdomen blackish brown with broad, transverse, silvery white bands on the underside. Legs black with narrow white annulations at the joints and with the outer spurs white.

*Alar expanse.*—10.5 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16763, U.S.N.M.

Very close to *U. repletana* Walker, but differing in the large basal black patch and the unmottled black tornal patch, as well as in the coloration and size of terminal joint of the palpi.

## Genus MACHLOTICA Meyrick.

*Type.*—*Machlotica chrysodeta* Meyrick.

### MACHLOTICA ATRACTIAS Meyrick.[1]

Second joint of labial palpi light yellow with two broad black annulations; terminal joint longer than second, light yellow, with a broad, longitudinal streak in front. Face and the head dark fuscous with yellow edges. Thorax dark purplish fuscous. Basal half of forewing light yellow, streaked longitudinally and transversely with purplish brown lines, forming a neat, checkered effect; apical half of the wing dark purplish fuscous with strong metallic, iridescent sheen; three broad, evenly edged, violaceous metallic, costal streaks; two short golden streaks just below apex; a terminal patch with two longitudinal, golden streaks intervein three longitudinal rows of small round golden dots; cilia dark purple. Hindwings dark purplish brown with silvery costal area below the forewings. Abdomen dark purplish brown with golden underside. Legs dark purplish brown with narrow, light yellow bars and tarsal annulations.

*Alar expanse.*—7 mm.

*Habitat.*—Bolivia, and Porto Bello, Panama, April.

A brilliant little moth, which I also have from Cordoba, Mexico, February; F. Knab, collector; and from Peru.

## Genus GLYPHIPTERYX Hubner.

*Type.*—*Glyphipteryx bergstraesserella* Fabricius.

### GLYPHIPTERYX PLENELLA, new species.

Labial palpi, face, head, and antennæ black. Thorax black with a central red spot; patagina black with red bases. Forewings deep brick-red with the ground color largely obscured by the extensive, metallic, greenish and black markings; extreme base and entire edge of the wing narrowly black; a transverse, straight, metallic, black bordered fascia across the middle of the wing; two costal and one dorsal, greenish metallic, black bordered, nearly perpendicular spots on basal half of the wing before the fascia; a strongly outwardly curved, greenish metallic, costal streak at apical third, the black border of which is continued into two black, longitudinal streaks, toward but not reaching the terminal edge; a long, curved, greenish metallic, black bordered streak from the end of the cell downward and along the terminal edge to just below apex; within the curve of this last streak are three longitudinal, parallel streaks with light ochreous intervals; cilia blackish. Hindwings black with whitish costal area; cilia black. Abdomen black. Underside of body and the legs black.

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[1] Trans. Entom. Soc. London, 1909, p. 38.

*Alar expanse.*—Male: 21 mm.; female: 24 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16765, U.S.N.M.

A perfect male and female of this gorgeous species taken while they were flying in copulation in the bright sunshine at Santa Rosa River, near Porto Bello; the species resembles a large *Heliodines*.

## Family ARRHENOPHANIDÆ.

Only two genera are at present recognized as belonging to this family. These may, according to Durrant, be separated as follows:

Forewings with veins 8 and 9 stalked, 10 absent = *Arrhenophanes* Walsingham.

Forewings with veins 9 and 10 stalked, 8 separate = *Cnissostages* Zeller.

### Genus ARRHENOPHANES Walsingham.

*Type.*—*Arrhenophanes perspicilla* Stoll.

#### ARRHENOPHANES PERSPICILLA Stoll.

*Phalaena Bombyx perspicilla* Stoll, Sup. Cramer's Pap. Exot., 1790, p. 74, pl. 16, fig. 8.

*Parathyris perspicilla* Hubner, Verz. Schm., 1820, p. 158, sp. 1641.

*Dasychira ? perspicilla* Walker, Cat. Lep. Brit. Mus., vol. 7, 1856, p. 1740.

*Parathyris ? perspicilla* Kirby, Syn. Cat. Lep. Het., vol. 1, 1892, p. 853, sp. 13.

*Parathyris perspicilla* Busck, Smiths. Misc. Coll., vol. 59, 1912, pp. 4, 8–10, pl. 1.

*Arrhenophanes perspicilla* Walsingham, Biol. Cent.-Amer., vol. 4, 1912, p. 205, pl. 7, fig. 7.

No additional material of this interesting species was obtained since my note on it last year. It is recorded from French Guiana, Para, Brazil, and from the Canal Zone, Panama. The larva is a case maker and feeds in silk-lined galleries in *Polyporus*.

#### ARRHENOPHANES CHIQUITA, new species.

*Male.*—Labial palpi light ochreous, tinged with brown. Tongue absent. Antennæ finely ciliated throughout. Face and head ochreous. Thorax ochreous, mixed with dark brown; posterior tuft long and thin. Basal two-thirds of the forewings golden brown suffused with dark burnt brown; an indistinct, oval, light ochreous spot on the middle of the fold edged with black; a larger, quadrangular, whitish ochreous spot at basal third of costa; at the end of the cell an indistinct group of black scales and base of costa darker than the rest of the wing; apical third of the wing, rather sharply separated from the basal dark part, is covered with large, circular or oval, whitish, semitransparent spots, with the narrow intervals light golden brown; cilia white with a dark brown pencil at apex and with tornal part blackish brown. Hindwings blackish brown with large, ochreous white, semitransparent spots; basal third whitish, a large, white spot of irregular outline across the base of veins at the end of the cell and two, small, round, white dots near tornus; also a larger white spot on the middle of termen; cilia blackish brown except for white tufts at apex and on the middle of termen. Abdomen and legs golden yellow; claspers and uncus very long, nearly a third of the abdomen.

*Alar expanse.*—12 mm.

*Habitat.*—Cabima, Panama.

*Type-specimen.*—Cat. No. 16766, U.S.N.M.

*Female.*—Not known but probably much larger. The species has the venation of the present genus, but the wing ornamentation of *Cnissostages* Zeller, which is not known to me except through descriptions and figures. Mr. Durrant states that this latter genus has vein 9 and 10 in the forewing stalked with 8 free, and if this proves a constant character it will amply separate the two genera, which, however, are closely related.

*Cnissostages* is also a fungus feeder, according Zeller, on *Boletis arborum*.

## Family TINEIDÆ.

### HARMACLONA, new genus.

*Type.*—*Harmaclona cossidella*, new species.

Labial palpi recurved; second joint long and bushy, especially laterally, reaching to middle of face; terminal joint very short and blunt, erect. Antennæ in the males very short, bipectinate; in the females somewhat longer, but less than half the forewing; thickened with scales; simple. Face and head clothed with erect scales. Forewings long, narrow; costa and dorsum straight, parallel; apex bluntly pointed, termen oblique; 12 veins; 2 from outer fifth of cell; 3 and 4 approximate from end of cell; 7 and 8 stalked, both to costa; 11 from before middle of cell; internal veins prominent, one from between 10 and 11 to between 6 and 7, another from base to vein 5. Hindwings broader than forewings; elongate; triangular; costa straight; termen very oblique; apex bluntly pointed; 8 veins, all separate; 3 and 4 approximate from the corner of the cell; 5 and 6 somewhat approximate; 6 and 7 parallel, oblique; cross vein between 8 and the cell; cilia short, scaling sparse; both wings being semitransparent. Posterior tibiæ with long loose hairs above.

The short, pectinated male antennæ and the strong internal veins as well as the robust body and the sparse scaling remind strongly of the family Cossidæ.

### HARMACLONA COSSIDELLA, new species.

Labial palpi white, sprinkled with reddish brown. Face and head reddish white sprinkled with brown. Antennæ dark brown with slight fugitive white scaling in the male. Thorax reddish white with a large, central, velvety brown patch and blackish brown, posterior tuft; patagina with a velvety brown spot at base. Forewings violaceous white with strong iridescent reflections; sparsely scaled; semitransparent; dusted with light brown, each scale having a light brown dot; along the veins, especially on dorsal half, are interrupted lines of scattered black scales; near apex are three small costal and three small dorsal blackish brown spots; cilia white, sprinkled with black. Hindwings hyaline, bluish, iridescent with darker veins and yellowish white cilia. Abdomen long and robust, sparsely clothed above with rusty brown, below with rusty white scales; anal tuft yellowish. Legs white sprinkled with brown and with brown tarsal joints.

*Alar expanse.*—22–42 mm.

*Habitat.*—Cabima, Porto Bello, and Alhajuela, Panama, April to October.

*Type specimen.*—Cat. No. 16767, U.S.N.M.

The United States National Museum possesses a large series of this singular species from Orizaba and Jalapa, Mexico, Sixola River and Juan Vinas, Costa Rica, W. Schaus, collector, and from Misantla, Mexico, R. Muller, collector.

### Genus AMYDRIA Clemens.

*Type.—Amydria effrenatella* Clemens.

#### AMYDRIA UMBRATICELLA, new species.

Brush on second joint of labial palpi dark brown mottled with black; terminal joint brown with two, ill-defined and indistinct, black annulations. Face light ochreous. Head somewhat darker ochreous. Thorax black. Forewing light ochreous suffused with brown and black; entire costal edge broadly black; a round black dot at the end of the cell; the area between this dot and tornus strongly mottled with black and dark brown; a small black dot at the base of dorsal edge; entire wing irregularly sprinkled with single black and brown scales; cilia light ochreous mottled irregularly with black. Hindwings dark brownish fuscous with lighter ochreous cilia. Abdomen dark brown. Legs dark brown; tarsi broadly annulated with black. The males are much smaller than the females and rather lighter in color.

*Alar expanse.*—Females, 20–22 mm; males, 11–14 mm.

*Habitat.*—La Chorrera, Alhajuela, Porto Bello, and Trinidad River, Panama. March and June.

*Type-specimen.*—Cat. 16768, U.S.N.M.

Commonly taken in copulation, in the thatched roofs of native houses and at light.

### Genus SCARDIA Treitche.

*Type.*—*Scardia boleti* Fabricius.

#### SCARDIA ISTHMIELLA, new species.

Labial palpi light ochreous brown on the inner side, blackish brown exteriorly. Face and head light ochreous brown; vertex touched with blackish brown. Antennæ ochreous. Thorax blackish brown; tips of patagina ochreous. Forewing dark bluish brown overlaid with black and with strong golden and iridescent reflections; costal edge with small, indistinct, geminate, ochreous spots, hardly discernible on basal half, more distinct on apical third; a broad, light, ochreous area along terminal edge sprinkled with black and brown scales; the ochreous space reaches from just before apex on the costal edge to apical third of dorsum; the edge toward the basal dark part is undulating; a black projection at the end of the cell encroaches upon the light part and just below the light part projects into the dark area; a series of small, dark brown dots along the apical and terminal edges. Hindwings dark purplish brown, with yellowish cilia. Abdomen dark brown above, light ochreous on the under side. Legs ochreous, strongly barred with blackish brown exteriorly.

*Alar expanse.*—30 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16769, U.S.N.M.

A large, typical, narrow-winged species, close to *S. coloradella* Dietz, but without any dorsal ochreous markings.

#### SCARDIA MINIMELLA, new species.

So nearly identical in coloration and markings to the foregoing species as to suggest their identity, but only about half the size of *S. isthmiella*. The only difference seems to be the more clearly defined costal geminate spots, the lighter underside of the wing, and the lighter colored abdomen of *S. minimella*, all of which might be variation only. Such extreme variation in size, however, is not normal within this genus, and it is clearly obligatory, as well as undoubtedly correct, to consider them distinct.

*Alar expanse.*—14–17 mm.

*Habitat.*—Porto Bello, Panama, March.

*Type-specimen.*—Cat. No. 16770, U.S.N.M.

## Family ACROLOPHIDÆ.

### Genus ACROLOPHUS Poey.

*Type.*—*Acrolophus vitellus* Poey.

### ACROLOPHUS PANAMÆ, new species.

*Male.*—Labial palpi reaching vertex; first joint long and curved; second and third joints short, erect; first and second joints thickened with appressed scales, slightly projecting at apex, light ochreous gray on their inner side and at apex, dark brown exteriorly; terminal joint flattened, tolerably pointed, blackish brown with extreme tip light ochreous. Face and head light ochreous brown mixed with gray and white scales. Thorax ochreous brown. Forewing light ochreous brown mixed with white, dark brown, and black scales; pattern very poorly defined, but a broad, oblique, dark brown streak may be made out from the middle of the fold to costa just before apex, adjoining the base of which is a large, blackish brown spot on the lower edge of the cell; a series of well defined, blackish brown costal spots and some diffused marginal brown spots on terminal edge. Hindwings dark brownish fuscous. Abdomen dark brown with light ochreous underside and anal tuft. Uncus and lateral claspers slender, curved downward and inward at tip. Legs ochreous on their inner side, dark brown exteriorly; tarsal joints blackish brown with narrow ochreous annulation. On the underside of the thorax just under the forewing is a large, dense tuft of ochreous gray hairs, which can be erected so as to obscure the sides of the head and the base of the forewings.

*Alar expanse.*—10–12 mm.

The females which were repeatedly taken in copulation with the males are considerably larger and with more pointed wings and rather lighter in general color. The labial palpi are hardly as long as in the males and more porrected. They have no thoracic tufts.

*Alar expense.*—17–21 mm.

*Habitat.*—Alhajuela, Cabima, Trinidad River, Tabernilla, Paraiso, and Corozal, Panama. April, May and June.

*Type-specimen.*—Cat. No. 16771, U.S.N.M.

In a series of more than sixty males, hardly two are quite alike and the different state of preservation adds much to the variation, but the general habitus, as well as the structural characters, makes it easy to place the species, which appears to be close to *A. ridicula* Meyrick, described from a unique male from Dutch Guiana.

### ACROLOPHUS BIFURCATA, new species.

Labial palpi dark grayish brown, very long, slender, overarching the head but held rather erect; each joint thickened with scales toward the tip; in the third joint these apical scales form a small free brush, giving the joint the appearance of being bifurcate. Head and thorax ochreous brown. Forewings dark grayish brown dusted with black and with numerous short, transverse, blackish streaks; two faint, light ochreous, longtitudinal streaks, one through the middle of the wing from base to the end of the cell, the other along the fold; at basal fourth just above the fold is a small, reddish brown, black edged spot; cilia ochreous brown dusted with black. Hindwings dark brown. Abdomen dark brown above, dark ochreous on the underside. Legs dark ochreous, broadly barred with blackish brown.

*Alar expanse.*—14–17 mm.

*Habitat.*—Corozal, La Chorrera, and Alhajuela, Panama. April, May.

*Type-specimen.*—Cat. No. 16772, U.S.N.M.

Recognized among the small sized species described in the genus by the long, slender, peculiarly tufted palpi.

### ACROLOPHUS BACTRA, new species.

Labial palpi light ochreous mottled with black exteriorly, long, slender, compressed, overarching thorax; two first joints somewhat thickened with appressed scales; terminal joint with large, rounded, compressed tuft. Face light ochreous. Head and thorax dark brownish fuscous. Forewing unusually narrow and pointed, of the same size and shape as the *Tortricid* genus *Bactra;* light ochreous brown, overlaid with darker brown and black scales; a series of equidistant, blackish brown, costal spots; a large, blackish blotch at the end of the cell and a blackish, oblique streak on the base of the cell; a blackish brown marginal line along termen; cilia ochreous dusted with black. Hindwings light fuscous. Abdomen dark brown with lighter brown underside and ochreous anal tuft. Legs light ochreous brown.

*Alar expanse.*—15–16 mm.

*Habitat.*—Alhajuela, Panama.

*Type-specimen.*—Cat. No. 16773, U.S.N.M.

The type-specimen has veins 7 and 8 stalked, 9 free; another specimen has vein 9 out of 7+8.

The pointed forewings single out this species among the small Acrolophidæ.

[SCIENTIFIC RESULTS OF THE PHILIPPINE CRUISE OF THE FISHERIES STEAMER "ALBATROSS." 1907-1910.—No. 31.]

# NEW SPECIES OF CRABS OF THE FAMILIES GRAPSIDÆ AND OCYPODIDÆ.

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The new species and subspecies here described will be illustrated in the final report on the collections obtained in Philippine and adjacent waters during the years 1907–1910 by the steamer *Albatross* of the United States Bureau of Fisheries.

The new forms are as follows:

*Varuna altimana.*
*Ptychognathus guijulugani.*
*Sesarma* (*Sesarma*) *palawanense.*
*Sesarma* (*Sesarma*) *vicentense.*
*Sesarma* (*Sesarma*) *mindanaoense.*
*Sesarma* (*Sesarma*) *edwardsi philippinense.*
*Sesarma* (*Sesarma*) *æquifrons.*
*Sesarma* (*Sesarma*) *tectum.*
*Sesarma* (*Holometopus*) *limbense.*
*Sesarma* (*Parasesarma*) *dumacense.*
*Sesarma* (*Parasesarma*) *moluccense jamelense.*
*Sesarma* (*Parasesarma*) *pangauranense.*
*Macrophthalmus sandakani.*
*Dotilla sigillorum.*
*Tympanomerus philippinensis.*

The genus *Varuna*[1] is expanded to include those species of *Ptychognathus* in which the front is prominent, sublaminar, its margin horizontal and distant from the anterior border of the antennular cavities; the antero-lateral teeth well-marked and acute; the upper surface of the wrist subquadrilateral and armed at the inner angle with a tooth or spine; all of which characters are common to typical *Varuna*. The species added to *Varuna* resemble *Ptychognathus* in having the exognath wider in the male than in the female.

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[1] Milne Edwards, Dict. Class. Hist. Nat., vol. 16, 1830, p. 511.

The genus *Varuna* as now modified comprises the following species:

*Varuna litterata* (Fabricius, 1798). Type-species.
*Varuna tomentosa* Pfeffer, 1889.
*Varuna dentata* (de Man, 1892).
*Varuna spinicarpus* (Ortmann, 1894).
*Varuna polleni* (de Man, 1895).
*Varuna affinis* (de Man, 1895).
*Varuna onyx* (Alcock, 1900).
*Varuna altimana* Rathbun, 1914.

## Family GRAPSIDÆ.

### Subfamily VARUNINÆ.

### VARUNA ALTIMANA, new species.

*Type-locality.*—Point Jamelo, Luzon; river, in 20-foot seine; July 13, 1908; 1 male.

*Type.*—Cat. No. 44558, U.S.N.M.

*Dimensions.*—Male type, length 20.7 mm., width 21.8 mm.

Surface uneven; H-depression deep; a groove either side of the intestinal region; a transverse groove runs inward behind the second and behind the third tooth; frontal and hepatic regions depressed; surface finely punctate and covered with still finer reticulating lines formed by flattened, confluent granules. Front broad, prominent, feebly bilobed, its lateral margins making an obtuse angle with the anterior margin. Upper border of orbit strongly S-shaped, forming at its union with the front a closed fissure ending in a triangular sinus. Antero-lateral margins moderately convergent, 3 teeth acute, with straight sides and separated by deep, narrow sinuses. Postero-lateral margins subparallel, slightly sinuous; a granulated line, beginning a little ways from the margin and considerably behind the last lateral tooth, forms the upper boundary of the very short and broad obliquely-vertical section of the branchial region.

Antennules obliquely folded; nasal lobe triangular. Sides of ischiognath parallel; in the male the exognath is large and much swollen; reaching nearly to the end of the merognath and one and three-fifths times as wide as the ischiognath; in the female the exognath is much flatter and narrower, being not quite so wide as the ischiognath.

Chelipeds stout in male; a fringe of hair on upper and inner edges of merus; carpus with a long spine which is triangular at the base, the tip acuminate, a tubercle at base of spine, just below anterior margin of segment; palms high, postero-inferiorly much swollen, posteriorly rugose; upper margin compressed and elevated in a flat lobe occupying the proximal two-thirds; fingers very broad and flat, narrowly gaping; immovable finger horizontal, with a blunt longitudinal ridge continued almost imperceptibly on the palm, and a sinus in the prehensile margin near the tip, teeth 9–11; dactylus strongly arched, armed with about 13 irregular teeth. Chelipeds of female weak, the palm and fingers each with a well-marked ridge.

Legs narrow; margins hairy; last 3 joints heavily fringed below; a sharp, subdistal spine on merus.

Abdomen of male subtriangular; terminal segment one and one-half times as long as its middle width.

This species is nearest to *V. affinis* (de Man)[1] but has a more sinuous orbital margin, a different-shaped maxilliped (exognath wider, and ischiognath not widening distally), a longer, slenderer carpal spine, a lobe on upper margin of hand, a gape between the fingers.

*V. spinicarpus*[2] has a more even carapace; less sinuous orbital margin; nasal lobe with sides angled, not straight; hand without a lobe above; merus-joints of legs with a small, inconspicuous spine; abdomen of male narrower.

The lateral margins of the carapace are less incurved anteriorly than in *V. tomentosa*[3] or *litterata*[4] so that the carapace is squarer. The union of the anterior with the lateral edges of the front makes more of an angle than in either of those species, where the corners are rounded off.

### PTYCHOGNATHUS GUIJULUGANI, new species.

*Type-locality.*—Guijulugan, Negros; April 2, 1908; 2 males, 2 females, adult (1 female ovig.).

*Type.*—Cat. No. 44668, U.S.N.M.

*Dimensions.*—Length of largest male, 8 mm., width 9.3 mm. Length of ovigerous female 8 mm., width 9 mm.

Associated with *P. barbata* at Guijulugan, were four specimens of a closely allied species.

Carapace a little broader than long, flat, regions indistinct; post-frontal tubercles well marked; the oblique portion of the branchial region is separated from the horizontal portion by a fine granular line in the posterior half.

Front sinuous, prominent, half as wide as greatest width of carapace; edge without a line of granules.

Antero-lateral teeth 3, blunt, the first or orbital tooth the longest, the last tooth very small; teeth not projecting sideways, sinuses triangular.

Upper border of orbit sinuous and oblique. The antennules fold nearly transversely. Epistome very narrow, almost linear; posterior border crenulate.

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[1] *Ptychognathus affinis* de Man, Zool. Jahrb., Syst., vol. 9, 1895, p. 97; vol. 10, 1898, pl. 28, figs. 21, 21*a*, 21*b*.

[2] *Ptychognathus spinicarpus* Ortmann, Zool. Jahrb., Syst., vol. 7, 1894, p. 711, pl. 23, figs. 13, 13*i*, 13*k*, 13*z*.

[3] Pfeffer, Jahrb. Hamburg. Wiss. Anst., vol. 6, 1888 (1889), p. 30.

[4] (Fabricius) Alcock, Journ. Asiatic Soc. Bengal, vol. 69, 1900, p. 401, and synonymy.

The maxillipeds are situated a considerable distance back of the edge of the buccal cavity.

Exognath broader than ischiognath in both sexes, more so in male than in female; ischiognath with subparallel sides; antero-external lobe of merognath very broad.

In the male the inner angle of the wrist is rectangular, not toothed; hand massive, with a squarish patch of hair at the distal end, which is continued part way on the fingers. The dactylus is a little more than twice as long as the upper margin of the palm, is finely toothed, and when closed leaves a gap between it and the horizontal fixed finger; the latter has fewer teeth, 2 or 3 of which near the middle are large. In the female the wrist bears an equilateral, acute tooth at its inner angle, the chela is weak, with a well-marked granulate ridge above the lower margin, and grooved fingers; near the tips there is on the inner and outer surfaces a row of short hairs which are appressed against the horny tips.

Legs rather narrow; no spine on meropodites; last 2 joints moderately hairy; the second and third pairs are about one and three-fourths times, the last pair one and one-fourth times, the length of the carapace.

Differs from *P. barbata*[1] in having the carapace a little narrower; front more advanced and less deflexed, lacking the double row of granules in that species; upper line of orbit more oblique and more sinuous; epistome about half as wide; distance between epistome and maxillipeds greater; in the male the exognath is wider, ischiognath narrower, and lobe of merognath larger, than in *barbata;* these characters are present, though less marked, in the female; inner angle of wrist of male squarer, inner distal margin of wrist shorter, so that upper surface of wrist is more oblong than in *barbata* (this difference less evident in female); in the presence of a row of short hairs about the ends of the fingers in the female.

### Subfamily SESARMINÆ.

#### SESARMA (SESARMA) PALAWANENSE, new species.

*Type-locality.*—River, Nakoda Bay, Palawan Island; December 31, 1908; 3 adult females, 1 of which is ovigerous.

*Type.*—Cat. No. 45792, U.S.N.M.

*Dimensions.*—Female, length of carapace 39.6 mm.; width between orbital angles 41.8 mm.; width between epibranchial teeth 40.5 mm.; width between posterior angles 36.7 mm.; width of front, 20.3 mm. Length of propodus 25.6 mm.; length of palm, between articulations, 9 mm.; length of dactylus, upper margin, 17.6 mm.

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[1] (A. Milne Edwards) de Man, Zool. Jahrb., Syst., vol. 9, 1895, p. 106, and synonymy; vol. 10, 1898, pl. 28, fig. 23.

Carapace a little broader than long, narrowing behind, the subrectangular epibranchial tooth at some little distance behind the acute orbital angle, the margin behind the second tooth slightly concave. Surface covered with tufts of coarse hair, intervening spaces smooth except for the customary granulate lines on the postero-lateral portions. Regions deeply separated from one another. Postfrontal lobes separated by deep and wide U-shaped sinuses, of which the median is much larger than the lateral; submedian lobes more than one and one-half times as wide as outer lobes. Surface of front very much as in *S. tæniolatum* White,[1] being concave and smooth except for a few tubercles; lower margin very sinuous. Upper margin of orbit long and sinuous and directed backward to the orbital tooth.

Upper margin of merus of cheliped armed with a large flat subdistal tooth; inner margin sparingly denticulate or spinose and expanded distally in a broad tooth. Outer surface of merus and carpus covered with granulated lines and tubercles; inner angle of carpus armed with a subrectangular tooth; outer and upper surface of propodus covered with tubercles, which for the most part are depressed and separated by reticulating grooves; fingers devoid of granules or tubercles except on the upper part of the dactylus; upper margin of palm thin, crossed by short, crowded and nearly longitudinal lines of granules, close to which runs a single line of smaller granules extending from the articulation with the carpus to the tooth at the distal end of the upper margin; no pronounced transverse elevation on inner surface of palm, but a feeble trace of a ridge; this surface is sparingly dotted with granules; fingers with a narrow gape (in the female), prehensile edges furnished with low uneven teeth; upper edge of dactylus margined, and milled inconspicuously on the proximal half with about 25 grooves which stop short of the basal end.

Ambulatory legs broad; third pair one and two-thirds times as long as carapace; merus joints broad, that of third pair a little over twice as long as broad, and armed with a strong, acute subdistal tooth; propodi long and dactyli short, the latter seven-tenths as long as the former in the third pair.

Terminal segment of female abdomen a little longer than wide and so deeply invaginated in the sixth segment that the latter reaches nearly as far forward as does the terminal segment.

Closely allied to *S. tæniolatum* from which it differs in its longer and narrower carapace; narrower front; in the greater difference in the width of the outer and inner frontal lobes; in the granulate, not pectinate, ridge near the upper margin of the palm, which is closer to that margin and not straight but follows the slight curve of the margin; and in the absence of a transverse ridge inside the palm.

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[1] Alcock, Journ. Asiatic Soc. Bengal, vol. 69, 1900, p. 419, and synonymy.

Our species resembles also *S. lafondii* Hombron and Jacquinot,[1] which has a similar ornamentation on the upper margin of the palm, no ridge inside the palm, but the upper margin of the movable finger entirely smooth; in this last character, *S. palawanense* is intermediate between *tæniolatum* and *lafondii*. The latter has an even broader carapace than *tæniolatum*, and its side margins are parallel instead of convergent.

### SESARMA (SESARMA) VICENTENSE, new species.

*Type-locality.*—Port San Vicente (Luzon side), Palaui Island, off northern Luzon; beach; Nov. 15, 1908; 1 male.

*Type.*—Cat. No. 45758, U.S.N.M.

*Dimensions.*—Male, length 8.8 mm., width at orbital angles 9.2 mm., posterior or greatest width 9.7 mm., width of front 4.6 mm.

A small, square species with 3-toothed side margins and a vertical front. Carapace a little wider than long, sides nearly parallel but slightly diverging posteriorly, and a little concave behind the third tooth; dorsal surface almost flat, except near the front and postero-lateral corners; regions delimited, surface roughened with crowded flattened granules anteriorly and with confluent grooves and pits posteriorly; on the hepatic and anterior branchial regions there are also unequal bead-granules. Suprafrontal lobes nearly transverse, separated by very small emarginations, the lobes of the inner pair a little more than one and one-half times as wide as those of the outer pair; from these lobes the front descends abruptly, lower margin horizontal, sinuous with two broad, shallow lobes and an equally broad median sinus; sides of front parallel, lower corners rounded, surface finely granulous, a tubercle on each side near the lower margin almost in line with the notch between the outer and inner postfrontal lobes.

Upper margin of orbit inclined obliquely backward and outward to the acutangled antero-lateral tooth; this is separated by a well-marked notch from the second tooth which is small and obtusangled; the third tooth is simply a smooth swelling of the margin.

Epistome covered with vesicular pubescence. Merus of outer maxillipeds equal in length to the ischium, its antero-lateral angles rounded off.

Only the left cheliped is present and that is rather small, not one and one-half times as long as the carapace. Lower and inner margins of merus denticulate, outer surface covered with short rugæ, upper margin formed by parallel, oblique rugæ. Upper surface of carpus crossed by granulated rugæ, inner angle bluntly rounded. Outer surface of hand nearly smooth, punctate, upper surface covered with sharp granules, and near the margin, with obliquely longitudinal and broken lines of granules; upper half of inner surface sparingly granulous, no transverse ridge present. The fingers do not gape when closed, although the irregular teeth do not fit snugly together; the upper margin of the dactyl bears 6 spinules on the proximal half.

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[1] Voy. l'*Astrolabe*, Atlas of Zoology, Crustacea, 1852 (?), pl. 6, figs. 4 and D.

Merus joints of legs diminishing toward both ends, upper surface roughened with fine granules, anterior margin with a short subdistal tooth tipped with a back bristle, merus of third pair about two and three-fourth times as long as wide. Last three joints narrow, bordered with dark bristles; dactyli nearly straight till near the tip, a little longer than their respective propodi.

In the male abdomen the margins are concave from the beginning of the fourth to the beginning of the sixth segment; terminal segment large, as wide as long, and as wide as the adjoining end of the sixth segment.

This species is most nearly related to *S. sinense* Milne Edwards.[1] It differs from *sinense* in its narrower front, only half as wide as the distance between the orbital angles, in having a third tooth on the side margins, in the middle part of the outer surface of the palm being nongranulate, and in the absence of a transverse granular line on the inner surface.

### SESARMA (SESARMA) MINDANAOENSE, new species.

*Type-locality.*—Small stream south of Cotabato, Mindanao; May 20, 1908; 1 female.

*Type.*—Cat. No. 45765, U.S.N.M.

*Dimensions.*—Type female, length of carapace 18.2 mm.; width at antero-lateral angles 19 mm., width at postero-lateral angles 20.2 mm., width of front 11.2 mm., height of same 2.3 mm., length of propodus of cheliped below 9.4 mm., same above 3.3 mm., height of same 4.2 mm., length of merus of third leg 15.6 mm., width of same 6 mm.

Carapace convex, regions well marked, especially the mesogastric and the cardiac; a groove parallel to the gastro-cardiac groove cuts off a narrow strip of the mesogastric region except across the middle; surface rough with coarse pits and fine grooves; from most of the pits a bunch of short hairs arises; one of these bunches is situated on each of the 4 tubercles behind the postfrontal lobes; the tubercles of the outer pair are further forward than those of the inner pair and are nearly the size of the postfrontal lobes. These lobes are deeply and widely separated, the outer ones three-fifths as wide as the inner ones; the intervening furrows are continued well back on the carapace; sides of front parallel, lower rim projecting, in dorsal view bilobed and with a broad median sinus, in front view arcuate and a little sinuous. Upper margin of orbit oblique, orbital angle acute; outer margin of orbital tooth sloping backward and inward; next lateral tooth rectangular; a trace of a third tooth, indicated by a thickening of the margin.

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[1] See de Man, Zool. Jahrb., Syst., vol. 2, 1887, pp. 648 and 669.

Outer surface of merus and carpus of cheliped of female crossed by short granulated rugæ; merus with a short acute tooth above, no large tooth but a row of denticles on the inner margin; no tooth at inner angle of wrist; palm relatively smooth and punctate, finely rugose in the proximal and upper portions; a few obliquely longitudinal granulated lines at the upper margin and just inside; inner margin almost smooth. The lower margin of the propodus is nearly straight; fingers nearly meeting, irregularly toothed; dactylus granulate at the proximal end, upper margin punctate.

Third leg about two and one-half times as long as carapace, its merus over two and one-half times as long as wide; a sharp spine above each merus; margins of last two segments and distal end of carpal segments furry; dactyli with long horny tips, definitely shorter than their respective propodi in the second and third legs, a very little longer than the propodi in the first and fourth pairs.

Near *S. modestum* de Man [1] and *S. longipes* Krauss.[2] From both it may be recognized by the wider front, different slope of the orbital tooth, smoother hands, longer merus joints of the legs; from the second by the shorter dactyli of the legs.

### SESARMA (SESARMA) EDWARDSI PHILIPPINENSE, new subspecies.

*Type-locality.*—Pangauran River, Port Caltom, Busuanga Island; Dec. 15, 1908; 3 males, 3 females (1 male is type); also Dec. 16, 1908, 1 female with Rhizocephalid parasite under the abdomen.

*Type.*—Cat. No. 45750, U.S.N.M.

*Dimensions.*—Type male, length of carapace 14.5 mm., width between the orbital angles 16.7 mm., width of front 9.6 mm.

This subspecies has a little wider carapace than typical *edwardsi;* the chelæ are narrower, the fingers more elongate and more horizontal; the abdomen of the male with the terminal segment deeply inserted in the sixth segment.[3]

Variety *brevipes* de Man [4] has a male abdomen similar to that of *philippinense*, but has much shorter legs. The legs of the Philippine form are as in typical *edwardsi.*[5]

### SESARMA (SESARMA) ÆQUIFRONS, new species.

*Type-locality.*—Pangauran River, Port Caltom, Busuanga Island; Dec. 15, 1908; 1 male (type), 1 female.

*Type.*—Cat. No. 45754, U.S.N.M.

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[1] Abh. Senckenb. naturf. Ges., vol. 25, 1902, p. 511, pl. 19, figs. 8–8*d*.

[2] Die Südafrikanischen Crustaceen, 1843, p. 44, pl. 3, figs. 2, *a*, *b*, *c*, *d*.

[3] See Journ. Linn. Soc. London, Zool., vol. 22, 1888, pl. 13, figs. 1–4.

[4] Zool. Jahrb., Syst., vol. 4, 1889, p. 425, pl. 9, figs. 6*a*, 6*b*.

[5] Idem, pl. 9, fig. 6*c*.

*Dimensions.*—Male, length of carapace 9.6 mm., width at epibranchial tooth 11.4 mm., width at anterior angles 11.2 mm., width at posterior angles 10.7 mm., width of front 7.2 mm., height of front 1 mm., length of third ambulatory leg 6.5 mm., width of same 2.9 mm.

Distinguished by the slightly marked frontal lobes and the well-defined upper surface of the palm.

Carapace sensibly wider than long, wider anteriorly than posteriorly, widest at the single epibranchial tooth, lateral margins a little concave; surface everywhere punctate, mesogastric region defined, as is also the posterior cardiac lobe; oblique lateral lines few, about seven, the anterior of these crossing the epibranchial tooth. Front very wide, widening below, superior lobes separated by shallow furrows, the lateral ones very short; outer lobes a little narrower than inner; surface of front nearly vertical, lower margin arcuate, although nearly straight at the middle. Upper margin of orbit directed very obliquely backward to the short and slightly advanced orbital tooth; next tooth subrectangular.

Maxillipeds widely gaping, the merus joints obliquely transverse. Chelipeds of male unequal; outer surface of arm, wrist, and proximal half of palm crossed by fine granulated rugæ which on the middle of the palm are longitudinal; no spine on upper margin of arm, only a blunt angle; inner margin sparingly denticulate and with a shallow rounded prominence; no tooth at inner angle of wrist; chelæ punctate; upper surface of palm flattened, limited outwardly by a smooth blunt ridge and inwardly by an uneven granulated margin; a transverse line of granules inside palm, otherwise surface nearly smooth. Fingers moderately gaping; the horny extremity embraces the subterminal tooth on each finger; upper margin of dactylus with a line of four distant spinules; lower margin of immovable finger straight except at tip; prehensile edges irregularly toothed, three teeth on each finger enlarged.

Ambulatory legs of moderate length; carpal and propodal segments densely hairy.

Abdomen of male narrow, with a large terminal segment which is nearly as wide as long.

Resembles the very briefly described *S. læve* A. Milne Edwards[1] in its smooth shining carapace, but the carapace is narrower than in *læve* (where it is 7 mm. × 10 mm.), and the front has not a straight margin.

The carapace has considerable resemblance to that of *S. semperi* Bürger,[2] but the legs are shorter, the palm has no transversely oblique ridges above, and the movable finger is very feebly ornamented on the upper margin, instead of having stout tubercles.

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[1] Nouv. Arch. Mus. Hist. Nat., Paris, vol. 5, 1869, p. 27.

[2] Zool. Jahrb., Syst., vol. 7, 1893, p. 630, pl. 21, fig. 1.

### SESARMA (SESARMA) TECTUM, new species.

*Type-locality.*—Port San Vicente, Palaui Island, off northern Luzon; seine; Nov. 14, 1908; 1 female adult.

*Type.*—Cat. No. 45766, U.S.N.M.

*Dimensions.*—Type female, length 18.3 mm., width at anterolateral angles 18.4 mm., greatest width (at middle of carapace) 20.2 mm., width of front 12 mm., height of front 3.7 mm., length of propodus of cheliped 9.2 mm., height of same 4.8 mm., superior length of palm 3.6 mm., length of merus of third leg 14.3 mm., width of same 5.3 mm.

This crab is densely covered with pubescence everywhere except on the corneæ, the terminal half of the fingers and the horny tips of the legs; tufts of longer hairs are disposed on carapace, chelipeds, and legs, including a tuft on each tubercle.

Carapace almost square, except for the two lobiform teeth which project laterally beyond the orbital tooth and make the carapace wider at those points. Regions limited by wide grooves. The principal tubercles are as follows: One large, behind each frontal lobe, the middle pair further back than the outer pair; one in the middle of the mesogastric region, and one on each side and nearly in the same line on the protogastric region; two side by side on the cardiac region; about three on each branchial region. Before the hairy coat is removed the tubercles seem to be more numerous. The surface is in the main smooth and shining, and there are no oblique ridges on the posterolateral regions. Frontal lobes prominent and deeply separated, the outer a little narrower than the inner. The front widens from above downward, is lowest at the outer ends and most prominent along the lower margin; this last is convex in front view, but sinuous from above, showing six shallow prominences; surface of front uneven. Upper margin of orbit very oblique; orbital tooth very slightly advanced, outer margin convex.

Chelipeds of female equal, of moderate size. Merus with a subterminal tooth on upper margin, and a slight prominence but no tooth on the inner margin. Outer surface of carpus covered with low tubercles; inner angle blunt. Chelæ, when hair is removed, smooth and shining, without ornamentation in the way of granules or lines but with two or three depressed and inconspicuous tubercles on upper surface, and fine punctæ in a reticulating pattern where the hairs are inserted; upper margin of palm blunt; lower margin of propodus nearly straight; fingers slender, prehensile edges finely toothed as far as to the horny extremities which occupy the distal third and are slightly notched where the tips cross each other. Merus joints of the legs bordered by irregular tufts of hair which have the appearance of lobes; a subterminal tooth on anterior margin; the tufts of hair on the upper surface of merus, carpus, and propodus look like granules or tubercles, but when they are removed the surface is seen to be glossy and in the main smooth though a little uneven; dactyli shorter than propodi, tapering to a very slender horny tip.

Terminal segment of abdomen of female inserted up to its middle in the sixth segment.

*S. tectum*, in the absence of rugose lines on the postero-lateral portions of the carapace, in the shining surface, lack of roughness or granulation, coat of setæ and hairs, resembles *S. lanatum* Alcock,[1] but the latter has a considerably wider carapace, with the tufts of hair smaller, more numerous and more uniform.

### SESARMA (HOLOMETOPUS) LIMBENSE, new species.

*Type-locality.*—Limbe Island, Gulf of Tomini, Celebes; November 12, 1909; 1 male (type), 2 females (1 ovigerous).

*Type.*—Cat. No. 45920, U.S.N.M.

*Dimensions.*—Male type, length of carapace 6.8 mm., width at antero-lateral angles 7.7 mm., width at postero-lateral angles 7.2 mm., width of front 4.4 mm.; ovigerous female, length of carapace 11.7 mm., width at antero-lateral angles 12.9 mm., width at postero-lateral angles 12.7 mm., width of front 7 mm.

Carapace deeply sculptured; not only are the interregional grooves deep, but the grooves separating the postfrontal lobes are continued halfway to the mesogastric region, and the branchial region shows several areolets along its inner border. Surface punctate and shining, with numerous very short and inconspicuous hairs. The antero-lateral tooth projects forward but not outward. Where the foremost of the oblique ridges joins the side margin, the latter is a little swollen. The front is about 4 times as wide as high, surface concave, sides converging below, lower margin slightly sinuous, and in front view, arcuate as well; a bunch of coarse granules near the middle of either half. Postfrontal lobes somewhat oblique, outer pair slightly narrower than inner pair.

Arm without spine above; inner margin with a triangular tooth denticulated on the edge. Palm rather smooth, sparingly punctate, with fine rugæ near the wrist and sparse granules near the top; upper margin a single slightly angled, granulated line running obliquely backward and outward from the distal angle of the palm to the point where it curves down to the articulation of the wrist. Within this margin and forming part of the inner surface, although visible from above, there are 2 or 3 granulated lines, the upper of which is, in the male, parallel to the upper margin; the others are also oblique but not parallel. The upper margin of the finger bears 8 or 9 scalariform tubercles in the male; in the female the tubercles are low and only 5 or 6 proximal ones are discernible.

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[1] Journ. Asiatic Soc. Bengal, vol. 69, 1900, p. 418; Illus. Zool. Investigator, Crust., pt. 10, 1902, pl. 65, figs. 4, 4a.

Legs long and narrow, the third pair more than twice as long as the carapace, and its merus two and one-third times as long as wide. The spine on the upper margin of the merus-joints is acuminate. The propodites are unusually long, the anterior margin of the third one being 4 times as long as its greatest width; the dactyls, on the other hand, are rather short, that of the third leg about two-fifths as long as the propodus. The dactyli are of uncommon form, convex on the anterior margin and also, but very slightly so, on the posterior margin, down to the long-pointed tip.

This species has no resemblance to any other of the subgenus *Holometopus*, but its general aspect is much like that of a Samoan species of the subgenus *Parasesarma*, which I shall describe later.

### SESARMA (PARASESARMA) DUMACENSE, new species.

*Type-locality.*—Dumaca River, Luzon; February 25, 1909; 1 female, thin-shelled.

*Type.*—Cat. No. 45922, U.S.N.M.

*Dimensions.*—Type female, length of carapace 13.2 mm., width between antero-lateral angles 17.6 mm., width between postero-lateral angles 15.7 mm., width of front 9.8 mm., length of propodus of cheliped below 7.9 mm., same above 3 mm., height of same 3.4 mm., length of merus of second leg 10.7 mm., width of same 4.8 mm.

Allied to *S. plicatum.*[1] The sides of the carapace are slightly concave; the antero-lateral tooth is acute; its outer margin does not curve inward toward the tip as in *S. plicatum,* but the tooth projects strongly outward. The interregional grooves are very deep, as are also the grooves separating the postfrontal lobes; these grooves are continued back nearly to the angles of the mesogastric region. On each branchial region there is a smooth longitudinally oblique ridge running near the side of the cardiac and intestinal regions. The lateral margins of the deflexed front converge below, while in *plicatum* they diverge; that part of the front lying before the antennules is very swollen. The propodus of the cheliped is more slender than in the female of *plicatum;* on the upper surface of the palm there is a pectinated ridge beginning at the distal inner angle of that surface and running in a longitudinally oblique direction, not in a transversely oblique direction, as in *plicatum;* parallel to this ridge there is a fine granulated ridge near the posterior margin. The protuberances on the upper margin of the movable finger are low and scalariform; there are about 7 on the proximal half, after that they become very faint; each one is divided by a transverse line into a large proximal portion and a small tuberculiform distal portion. The anterior or upper margin of the meropodites of the ambulatory legs

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[1] (Latreille) Rathbun, Kgl. Danske Vidensk. Selsk. Skrifter, 7 Række, naturv. og math. Afd., vol. 4, 1910, p. 329, and synonymy.

is less convex in the distal half than in *plicatum*, so that the segment is wider distally than in that species.

*Color.*—In alcohol the carapace is blotched, and the legs finely mottled, with dark on a light ground.

### SESARMA (PARASESARMA) MOLUCCENSE JAMELENSE, new subspecies.

*Type-locality.*—Point Jamelo, Luzon, in river; taken in 20-foot seine; July 13, 1908; 2 males, 2 females (1 male is type).

*Type.*—Cat. No. 45917, U.S.N.M.

*Dimensions.*—Type male, length of carapace 10 mm., width between antero-lateral angles 11.3 mm., width between postero-lateral angles 10.8 mm., width of front 6.6 mm., length of propodus of cheliped below 7 mm., same above 3 mm., height of same 4 mm., length of merus of third leg 7.7 mm., width of same 3.4 mm.

This form differs from typical *moluccense* de Man,[1] in having the carapace a little narrower in proportion to its length; in the front also narrower in proportion to the width between the antero-lateral angles; in the 9 or 10 tubercles on the upper margin of the movable finger being obliquely transverse instead of longitudinal, each tubercle trending forward or distally toward the inside of the finger, as in *S. lenzii* de Man.[2]

As in the typical species, the carapace is widest at the anterior angles; the surface of the front bears an elongated transverse tubercle near the lower margin on either side of the middle, and a round tubercle underneath the outer corner of the postfrontal lobes of the inner pair; the upper margin of the arm has no subdistal spine, only an obtuse tooth, the lower margin has a triangular expansion with denticulate border, and a spine or sharp tooth at the angle; the upper surface of the palm has two oblique pectinated ridges subparallel to the posterior margin, the ridges being prolonged backward by simple granulated lines toward the articulation with the carpus; in the female the ridges are more longitudinal; the merus joints of the legs bear a sharp spine on the upper margin; the abdomen of the male is shaped as in *S. lenzii.*[3]

### SESARMA (PARASESARMA) PANGAURANENSE, new species.

*Type-locality.*—Pangauran River, Port Caltom, Busuanga Island; December 15, 1908; 1 female ovig.

*Type.*—Cat. No. 45909, U.S.N.M.

*Dimensions.*—Type female, length of carapace 4.8 mm., width at antero-lateral angles 6.5 mm., width at postero-lateral angles 5.6

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[1] *Sesarma melissa* var. *moluccensis* de Man, in Max Weber, Zool. Ergebnisse einer Reise nach Niederländisch Ostindien, vol. 2, 1892, p. 328.

*Sesarma* (*Parasesarma*) *moluccensis* de Man, Zool. Jahrb., Syst., vol. 9, 1895, p. 202; vol. 10, 1898, pl. 31, fig. 36.

[2] Zool. Jahrb., Syst., vol. 10, 1898, pl. 30, fig. 35*g*.

[3] Idem, pl. 30, fig. 35*b*.

mm., width of front 3 mm., length of merus of third leg 4.3 mm., width of same 1.5 mm.

The lateral margins of the carapace are slightly concave behind the acute antero-lateral spine; the upper margin of the orbit is long and sinuous; the surface is coarsely punctate, and on the anterior part, single coarse bristles proceed from some of the punctæ. Front high, about one-fourth its width, sides parallel, lower margin most produced downward at the middle. Outer postfrontal lobes scarcely more than half as wide as inner ones, their anterior margin being continued downward toward the lower outer angle of the front.

Arm without subdistal spine on upper margin, but with a triangular spine on inner margin. The outer surface of the palm has a microscopic granulation and is coarsely and sparsely punctate; on the upper part there are a few larger granules; the upper surface is crossed by three irregular longitudinally oblique ridges subparallel to the posterior margin. Inner surface of palm without transverse ridge. The upper margin of the finger has a row of very small and low tubercles, of which there are about 11 on the proximal half; on the distal half no tubercles are perceptible.

Legs slender, especially in the last three segments; the merus joints have no subdistal spine above, but only a right-angled tooth; the dactyli are long and straight to near the end.

*Color.*—The carapace in alcohol is dark, and the legs are cross-banded with dark; on the propodal segments there are two dark bands.

This little species, for the mature female is only a quarter of an inch wide, has much in common with *S. calypso*,[1] in which, however, the front is wider and lower, the meropodites of chelipeds and legs have a superior spine, the meropodites of the legs are wider and the dactyli more curved.

## Family OCYPODIDÆ.

### Subfamily MACROPHTHALMINÆ.

### MACROPHTHALMUS SANDAKANI, new species.

*Type-locality.*—Sandakan, Borneo; shore; March 3, 1908; 1 female.

*Type.*—Cat. No. 44546, U.S.N.M.

*Dimensions.*—Female, length 8.2 mm., width at antero-lateral angles, 18 mm.

*Female.*—Carapace a little more than twice as wide as long; sides posteriorly convergent; first of the 3 antero-lateral teeth situate on the upper margin of the orbit, the second tooth forming the angle of the carapace; 3 granulated tubercles in a longitudinal row on the branchial region; 2 deep, curved, transverse grooves on the anterior half of the lateral regions. Eyes reaching nearly to end of orbit, but halfway between tips of first and second teeth. Front moderately constricted, anterior edge truncate. Lower edge of orbit prominent, crenulate.

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[1] De Man, Zool. Jahrb., Syst., vol. 9, 1895, p. 185; vol. 10, 1898, pl. 30, fig. 34.

Upper half of outer surface of palm granulate. Ambulatory legs sparsely furnished with long fine hairs, most numerous on the margins of the fourth leg and the anterior margin of the merus of the third leg; a sharp subdistal spine on anterior margin of second and third legs.

Allied to *M. brevis* (Herbst)[1]=*M. grandidierii* Milne Edwards[2] and to *M. sulcatus* Milne Edwards.[3] *M. brevis* lacks the row of tubercles on the branchial region; the tooth at the antero-lateral angle of the carapace is broader; the anterior margin of the merus of the first three legs is densely hairy. In *M. sulcatus* the eyes reach beyond the carapace, the surface of the hand of the female is smooth, the legs are unarmed.

## Subfamily SCOPIMERINÆ.

### DOTILLA SIGILLORUM, new species.

*Type-locality.*—Sandakan Bay, Borneo; in seine; March 2, 1908; 1 female, mature.

*Dimensions.*—Length of carapace, 6 mm.; width of carapace, 9.4 mm.; thickness of body, 6.3 mm.

*Type.*—Cat. No. 44549, U.S.N.M.

Body very thick. Carapace very convex, short and broad, nearly smooth, and naked; a broad furrow on the front is continued across the gastric region; from each side of the mesogastric region a deep narrow groove runs back on the branchial region to a point opposite the cardiac region, where it turns outward and forward, forming a loop. Orbit shallow, oblique, its upper limit indicated only by a fine smooth rim as far as the tooth at the outer end; this last is very obtuse-angled and bounded posteriorly by a shallow notch. The orbit is on a much lower level than the apparent margin of the carapace; this margin is partially indicated by a very fine granulated line, which is present above the middle of the ocular peduncle, and also about the antero-lateral angle. There is a similar granulated line above the postero-lateral margin and the base of the last leg. Sides of the carapace vertical and horizontally grooved. Front narrow, deflexed vertically, lateral margins convergent, slightly hollowed at base of eye-stalks, extremity broadly triangular; surface smoothly elevated along the sides, a circular elevation in the center of the broad median furrow. Lower border of orbit finely crenulate.

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[1] *Cancer brevis* Herbst, Naturg. Krabben u. Krebse, vol. 3, Heft 4, 1804, p. 9, pl. 60, fig. 4.

[2] Nouv. Arch. Mus. d'Hist. Nat., Paris, vol. 4, 1868, p. 84, pl. 20, figs. 8-11.

[3] Ann. Sci. Nat., Zool. (3), vol. 18, 1852, p. 156 (120).

Subbranchial, subhepatic and pterygostomian regions pubescent, sculptured. Epistome broad and very shallow, distant from, and above, the anterior margin of the merognath; the intervening space is filled by the palpus. Maxillipeds very large, bulging, the merus broader than long and about three times as large as the ischium, intermediate sulcus slightly oblique; merus with an antero-internal angle, and a sulcus along the anterior and the external margins.

The chelipeds of the female are of moderate size, equal, finely granulate; a broadly oval tympanum extends half the length of the merus; the carpus is not much longer than wide, inner angle rounded; the manus increases in width distally, its height is nearly as great as its horizontal length across the middle, lower edge with a sharp granulated line which is continued half way along the finger, upper surface rounded; fingers long, slender, deflexed, curved inward, a granulated ridge on the outer surface of each and on the upper edge of the dactylus, but the distal third of the fingers is smooth; tips very slender, horny, overlapping; there is a narrow gape and a shallow prominence near the base of the dactylus.

Legs granulate; merus joints dilated, the tympana strongly marked, smooth, occupying the entire width and about three-fourths the length of the segments; dactyli much longer than carpal joints, grooved, carinæ sparingly fringed with hair.

Sternum and abdomen smooth and shining; abdomen subcircular.

This species is very distinct from any before described. It is thick like *D. myctiroides* (Milne Edwards)[1] and *D. wichmanni* de Man,[2] but the carapace is much shorter and broader and almost devoid of ornamentation. The merognath is wider than in any other species of *Dotilla*, the ischium-merus having much the form of that in *Scopimera investigatoris* Alcock,[3] but the division sulcus is situated much further back. *D. profuga* Nobili[4] is the only species which approaches ours in the reduction of the epistome. The tympana are larger and more conspicuous than in any other species.

### TYMPANOMERUS PHILIPPINENSIS, new species.

*Type-locality.*—Guijulugan, Negros; shore; April 2, 1908; 1 male.

*Type.*—Cat. No. 45597, U.S.N.M.

*Dimensions.*—Type male, length 3.2 mm., width 5.2 mm.

Carapace subpentagonal, the upper margins of the orbit being oblique and the lateral margins of the carapace converging posteriorly; carapace convex from front to back, uneven, granulate; front almost wholly visible in dorsal view, more than one-fourth as wide, in its posterior or widest part, as the distance between the outer angles of the orbit; sides of front converging downward, lower margin rounded; surface concave; orbits with a dorsal inclination, upper margin sinuous; tooth at outer angle obliquely truncate externally, separated by a long, rounded sinus from the second tooth, which is small, obtuse and laminar, continuous with the postero-lateral margin; a raised line above and subparallel to the posterior margin.

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[1] Ann. Sci. Nat., Zool. (3), vol. 18, 1852, p. 152, pl. 4, fig. 24.

[2] Weber, Zool. Ergeb. einer Reise in Niederl. Ost-Indien, vol. 2, 1892, p. 308, pl. 18, fig. 8.

[3] Illus. Zool. Investigator, Crust., pt. 10, 1902, pl. 63, fig. 4b.

[4] Boll. Mus. Zool. Anat. comp. R. Univ. Torino, vol. 18, 1903, No. 447, p. 22.

On outer half of merus of maxilliped there is a groove subparallel to the outer margin. Chelipeds twice as long as carapace, granulate; wrist without tooth at inner angle; hands as high as their length at the middle, a little longer than the fingers measured horizontally; lower margin of propodus strongly sinuous, the manus convex below, the finger bent downward; upper margin of dactylus finely serrulate, a low tooth on the basal half of the prehensile edge; no tooth nor sinus on the prehensile edge of the immovable finger; that edge in both fingers denticulate. Legs long and narrow, sparingly hairy; merus joints dilated, without tympana, dactyli nearly as long as propodi.

First two segments of abdomen very short; third longer than first and second together, sides rounded; fourth not quite so long nor wide as third, its distal edge trilobate; fifth segment about as long as its distal width, constricted at base, sides sinuous; sixth segment broader than long, sides sinuous, forming a small tooth at proximal end.

The species in general appearance resembles *T. stapletoni* de Man,[1] which has transverse orbits, horizontal immovable fingers, almost smooth palms, and stout legs.

*T. pusillus* (de Haan)[2] has a more pentagonal carapace than the new species, the orbits and also the lateral margins being more oblique; the granules on the palm are reticulated, the immovable finger is horizontal, and both fingers have a strong ridge through the middle of the outer surface; the merus joints of the legs are provided with tympana.

In *T. orientalis* (de Man)[3] the surface of carapace and hand is smooth, the carapace widens posteriorly, the cheliped and especially the carpus is elongate.

In *T. ceratophora* (Kœlbel),[4] the eyestalk bears a long stylet which projects beyond the cornea, the chelipeds are elongate, the immovable finger has a strong tooth on its prehensile edge.

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[1] Rec. Indian Mus., vol. 2, 1908, p. 212, pl. 18, fig. 1.

[2] *Ocypode* (*Cleistostoma*) *pusilla* de Haan, Fauna Japon., Crust., 1835, p. 56, pl. 16, fig. 1.

[3] *Dioxippe orientalis* de Man, Journ. Linn. Soc. London, Zool., vol. 22, 1888, p. 138, pl. 9, figs. 8–10.

[4] *Dioxippe ceratophora* Kœlbel, in Count Széchenyi's Keletarzsiai utjanak tudomanyos Eredmenye, Budapesth, 1896, p. 714, pl. 1, figs. 8–12. (Title copied from Zool. Rec. 1899). For German translation, see Wissenschaftliche Ergebnisse der Reise des Grafen Béla Széchenyi in Ostasien 1877–1880, vol. 2, Wien, 1898, p. 573, pl. 1, figs. 8–12.

# NAMES APPLIED TO THE NORTH AMERICAN BEES OF THE GENERA LITHURGUS, ANTHIDIUM, AND ALLIES.[1]

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By T. D. A. Cockerell,

*Of the University of Colorado.*

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The Anthidiine and Lithurgine bees, representing two groups of Megachilidæ, are interesting on account of their habits, and frequently well-marked or even very peculiar structural characters. The Anthidiines, nearly always spotted or banded with yellow on the abdomen, are very well represented in our fauna, and are even to be found in the Miocene deposits of Colorado. *Lithurgus*, on the other hand, has only a few species in our fauna, although it is an old genus, found in the European Miocene, and widely spread over the earth, even to Australia and the islands of the Pacific.

## LIST OF SPECIES.

### Genus ANTHIDIUM Fabricius.

A genus of many species, found in most parts of the world, but absent from Australia and New Zealand.

The females use cottony fibers in making their nests, and are called by Fabre "Cottoniers."

For a discussion of the Palearctic genera and groups included by authors in Anthidium, see Entomologist's Record, vol. 21, No. 12.

#### Tables.

(1) Cockerell, Bull. So. Cal. Acad. Sci., vol. 3, 1904, pp. 56–58. (Males.)
(2) Cockerell, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 249.
(3) Friese, Das Tierreich, Megachilinæ, lief. 28, 1911, pp. 379–381.
(4) Friese, Das Tierreich, Megachilinæ, lief. 28, 1911, pp. 391–392.
(5) Cockerell, University of Colorado Studies, vol. 4, 1907, pp. 249–250.
(6) Swenk, University [of Nebraska] Studies, vol. 14, no. 1, 1913, pp. 9–11.

**americanum** Friese, 1911. Tab. 4.

New name for *A. maculatum* Smith, preoccupied.

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[1] The asterisk (*) indicates that the species is in the collection of the United States National Museum. Some species sent to the United States National Museum by Prof. T. D. A. Cockerell labeled "cotypes," are here listed as "paratypes," since Professor Cockerell uses the name "cotype" in the sense in which the museum uses "paratype." The museum has considerable material in the Anthidiine group and when this material is all determined the number of species in its collection will be considerably increased. Of the 107 names (fossil species omitted) in this list in the Anthidiine bees, 47 are represented by specimens in the collection. Of this 47, 20 are types or paratypes.—J. C. Crawford.

Proceedings U. S. National Museum, Vol. 47—No. 2045.

***angelarum** Titus, 1906. Los Angeles County, California (Coquillett).
Female 9½ mm.; markings deep yellow, scopa very white, sixth abdominal segment with large yellow spots.
*Type.*—Cat. No. 9034, U.S.N.M.

***astragali** Swenk, 1913. Bad Lands at mouth of Monroe canyon, Sioux County, Nebraska. (M. Cary). Tab. 6.
Paratype.—Cat. No. 15259, U.S.N.M.

**atrifrons** Cresson, 1868. New Mexico (S. Lewis).
Same as *emarginatum.*

**atriventre** Cresson, 1878. California (Hy. Edwards). Tab. 3.
Female with ventral scopa and hair of face fuscous or black.

**atriventre** Smith. 1879. Orizaba, Mexico.
Name preoccupied: =*orizabæ.*

**aztecum** Cresson, 1878. Mexico (Sumichrast). Tab. 4.
Allied to *cognatum.*

***banningense** Cockerell. 1904. Banning, California (Davidson). Tab. 1.
Male 14½ mm.

***bernardinum** Cockerell, 1904. Strawberry Valley, California (Davidson). Tab. 1.
Male about 14 mm.; allied to *A. pecosense.*
*Paratype.*—Cat. No. 13666, U.S.N.M.

***bernardinum aridum** Cockerell, 1904. Rock Creek, California (Davidson). Tab. 1.
Scape of male yellow in front.

***bernardinum fragariellum** Cockerell, 1904. Strawberry Valley, California (Davidson). Tab. 1.
Scape of male all black.

**bernardinum wilsoni** Cockerell, 1904. Mount Wilson, California (Davidson). Tab. 1.
Male about 11 mm.

**blanditum** Cresson, 1879. Nevada (Morrison). Tab. 2, 3.
Coxæ and trochanters (female) all black.

**blanditum praedentatum** Cockerell, 1907. Boulder, Colorado (G. Hite). Tab. 5.
Known (female) from *A. montivagum* and *A. porteræ* by the bright lemon-yellow sixth abdominal segment, its margin evidently notched in the middle, and the elongated marks over the eyes. Referred later to *A. placitum* as a variety.

**californicum** Cresson, 1879. California (H. Edwards). Tab. 1, 3.
Fowler describes the female from Berkeley and Redlands, California. Fox describes a variety from Lower California.

**clypeodentatum** Swenk, 1913. Sioux county, Nebraska. Tab. 6.

***cognatum** Cresson, 1878. Georgia (Morrison). Tab. 3.
Characters: Trans. Amer. Ent. Soc., vol. 29, p. 175. Illinois (Robertson).

**compactum** Provancher, 1896. Los Angeles, California (Coquillett).
Name preoccupied: =*collectum.*

**conspicuum** Cresson, 1879. Nevada (Morrison). Tab. 3, 5.
Male: Entom. News, 1909, p. 262.
Also in Colorado.

**collectum** Huard, 1896. Tab. 1, 3.
Allied to *A. emarginatum;* see Bull. Southern California Acad. Sci., May 1904, p. 73.
New name for *A. compactum.*

**collectum ultrapictum** Cockerell, 1904. Tehachapi, California (Davidson).
Male a little larger; scape with a yellow stripe; abdominal bands very bright yellow, only that on first segment divided into four spots.

**crassipes** Cresson, 1878. Florida (Tatnall). Tab. 3.
Ventral scopa yellowish; legs very robust.

**edwardsii** Cresson, 1878. California (Hy. Edwards). Tab. 3.
Dorsal hair of head and thorax dense and fulvous.

***emarginatum** Say, 1824. Tab. 3, 5, 6.
Face of female black.
Cresson redescribes it from specimens collected in Kansas.

**emarginatum atripes** Cresson, 1879. Nevada (Morrison).
Male with legs entirely black.

**exhumatum** Cockerell, 1906. Fossil in the Miocene shales of Florissant (Scudder).

**flavolineatum** Smith, 1879. Oajaca, Mexico=*Dianthidium flavolineatum.*
Female 8 mm., a short narrow line behind the eyes yellow.

***harbecki** Crawford, 1910. Wenonah, New Jersey (H. S. Harbeck).
Has a pulvillus, "Related according to the swollen legs to *larreæ* and to *crassipes.* Outside of that one character it does not seem close to any others." (Crawford in letter.)
*Type.*—Cat. No. 13454, U.S.N.M.
This is to be referred to *Heteranthidium* on the authority of Mr. Crawford.

**hesperium** Swenk, 1913. Palo Alto, California.

**hesperium dentipygum** Swenk, 1913. Laramie, Wyoming.

***illustre** Cresson, 1879. Nevada (Morrison). Tab. 3.
Fowler described the male from Redlands, California.
Nesting habits; Entom. News, 1904, p. 284.
This species is to be referred to *Dianthidium.*

**illustre consonum** Cresson, 1879. Nevada (Morrison).

**impatiens** Smith, 1879=*Dianthidium impatiens.* Tab. 4.
Male 8½ mm.

**incurvatum** Swenk, 1913. Ute creek, Costilla County, Colorado (H. S. Smith).

**jocosum** Cresson, 1878. Colorado (Ridings). Tab. 3.
"A pretty little species, with the bands on apex of abdomen broad and uninterrupted." (Cresson.)

***lupinellum** Cockerell, 1904. Pecos, New Mexico (W. P. Cockerell). Tab. 1.
Male about 11 mm.; clypeus all yellow. Visits *Lupinus.*
Also in Texas.

**maculatum** Smith, 1854. Mexico.
Notes on type: Trans. Amer. Ent. Soc., vol. 21, p. 336.
Apex of male abdomen with long straight parallel blunt spines, the outer ones very much longer than the middle one; subapical lateral spines hooked.
Renamed *A. americanum* Friese, 1911.

**maculifrons** Smith, 1854. "United States." Tab. 3.

***maculosum** Cresson, 1678. "Utah (Putnam); California (H. Edwards)." Tab. 2, 3.
Male; Ann. Mag. Nat. Hist., May 1900, p. 412.

**montivagum** Cresson, 1878. Colorado (Ridings). Tab. 2, 3.

**mormonum** Cresson, 1878. Utah (Ulke). Tab. 3.

**nebrascense** Swenk, 1913. Sowbelly canyon, Sioux County, Nebraska (R. W. Dawson). Tab. 6. Also in Wyoming.

**orizabæ** Dalla Torre=*Dianthidium orizabæ.* Tab. 4.
Abdominal scopa black.

**palliventre** Cresson, 1878. California (Hy. Edwards). Tab. 1, 3.
Supposed male; Bull. Southern California Acad. Sci., April, 1904, p. 60.

**palmarum** Cockerell, 1904. Palm Spring, California (Davidson). Tab. 1.
Tegulæ apricot color.

**paroselæ** Cockerell, 1898. Mesilla, Nex Mexico (Cockerell). Tab. 1.
Male: Ann. Mag. Nat. Hist., May 1900, p. 412.
Nesting habits; Minnie Newberry, Psyche, 1900, p. 94.

***pecosense** Cockerell, 1904. Pecos, New Mexico (Cockerell). Tab. 1, 2.
Also at Flagstaff, Arizona (F. C. Pratt).

***perplexum** SMITH, 1854. Georgia. Tab. 3.

Legs and margin of thorax ferruginous.

This is to be referred to *Dianthidium* subgenus *Anthidiellum* on the authority of Mr. Crawford.

**placitum** CRESSOON, 1879. Nevada (Morrison). Tab. 2, 3.

Female clypeus yellow except a median stripe; a yellow band behind ocelli, interrupted in middle.

**placitum prædentatum** COCKERELL, 1907. Boulder, Colorado (G. Hite). Tab. 2, 5.

***porteræ** COCKERELL, 1900. Las Vegas, New Mexico (W. Porter). Tab. 1, 5.

Prior to 1900 confused with *A. maculifrons*.

Also in Texas, and north to Calgary in western Canada.

*Type*.—Cat. No. 5812, U.S.N.M.

***porteræ amabile** COCKERELL, 1904. Boulder, Colorado (Cockerell). Tab. 5.

Ground color of abdomen red.

*Type*.—Cat. No. 9655, U.S.N.M.

***porteræ personulatum** COCKERELL, 1907. Boulder, Colorado. (W. P. Cockerell). Tab. 5, 6.

Female clypeus entirely black; male with apical lobes and spine of abdomen black.

***poudreum** TITUS, 1902. Fort Collins, Colorado (Titus). Tab. 2.

"*pondreum*," in the original publication, is a misprint.

Male (11 mm.) differs from *atrifrons* by the yellow markings, scape entirely black, and last abdominal segment deeply notched, with a blunt black tooth in middle. Variety (? hybrid with *tenuifloræ*); Ent. News, 1909, p. 262.

Also at Flagstaff, Arizona (Pratt).

**praedentatum trianguliferum** SWENK, 1913. Fort Garland, Costilla County, Colorado (L. Bruner).

***psoraleæ** ROBERTSON, 1902. Near Carlinville, Illinois (Robertson) Tab 6.

Characters: Trans. Amer. Ent. Soc., vol. 29, p. 175.

Face of female black.

***ridingsii** CRESSON, 1878. Georgia (J. Ridings). Tab. 3.

"A very distinct species, easily recognized by the abdominal fasciæ being very narrow and regular." (Cresson.)

This is to be referred to *Heteranthidium* on the authority of Crawford.

**rodriguezi** COCKERELL, 1912. Guatemala (Rodriguez).

**sagittipictum** SWENK, 1913. Pullman, Washington (C. V. Piper).

**saxorum** COCKERELL, 1904. Rock Creek, California (Davidson). Tab. 1.

Abdomen shining, with sparse punctures, the markings orange.

**scudderi** COCKERELL, 1906. Fossil in the Miocene shales of Florissant (Scudder).

**serranum** COCKERELL, 1904. Rock Creek, California (Davidson) Tab 6.

Male 15½ mm. Comparison with *illustre* and *conspicuum;* Ent. News, 1909, p. 262; also Bull. Southern California Acad. Sci., Feb. 1904, p. 23.

***tenuifloræ** COCKERELL, 1907. Boulder, Colorado (W. P. Cockerell). Tab. 5, 6.

Allied to *emarginatum;* female ventral scopa sepia brown, pale at sides; male with dark tubercles and scutellum.

Also in Montana and western Canada.

**titusi** COCKERELL, 1904. Fort Collins, Colorado (E. S. G. Titus). Tab. 1, 5.

Allied to *emarginatum*.

**transversum** SWENK, 1913. Ute creek, Costilla County, Colorado (H. S. Smith).

***tricuspidum** PROVANCHER, 1896. Los Angeles, California (Coquillett). Tab. 1, 3.

Titus (1906) gives a new description.

***utahense** SWENK, 1913. Logan, Utah.

Paratype.—Cat. No. 15260, U.S.N.M.

**wallisi** COCKERELL, 1913. Peachland, British Columbia (J. B. Wallis).

Described in Canadian Entomologist, 1913, p. 13.

### Genus DIANTHIDIUM Cockerell.

A very widespread genus, rather more so than *Anthidium*, since there is one species in Australia.

The females use resin in making their nests, and are called by Fabre "Résiniers." Pulvilli are present on the feet of this genus, but absent in true *Anthidium*.

### SUBGENERA AND SECTIONS.

**Paranthidium** T. and W. COCKERELL, 1901.
*Type.—Perpictum* Cockerell.

**Anthidiellum** COCKERELL, 1904.
*Type.—Strigatum* Panzer (European).

### TABLES.

(1) Cockerell, Bull. Southern California Acad. Sci., vol. 3, 1904, pp. 3–4.
(2) Friese, Das Tierreich, Lief. 28, Megachilinæ, 1911, pp. 379–381.
(3) Friese, Das Tierreich, Lief. 28, Megachilinæ, 1911, pp. 391–392.
(4) Swenk, University [of Nebraska] Studies, vol. 14, No. 1, 1913, pt. 25–6.

**agnatum** CRESSON, 1878. Mexico (Sumichrast). Tab. 3.
Wings fuliginous.

**apicale** CRESSON, 1878. Mexico (Sumichrast). Tab. 3.
This, *bivittatum* and *toltecum* "are closely related, and have a short, broad, robust form somewhat like that of *perplexum* and *notatum*" (Cresson).

**balli** TITUS, 1902. Ridgeway, Colorado, July 31 (E. D. Ball).
Length 14 mm., markings dark rich yellow; allied to *venustum*.

***bivittatum** CRESSON, 1878. Mexico (Sumichrast). Tab. 3.
Mesothorax with two yellow stripes.
Guatemala (Barber and Schwarz). Female described; Ann. Mag. Nat. Hist., July, 1913, p. 108.

**boreale** ROBERTSON, 1902. Near Carlinville, Illinois (Robertson).
Allied to *D. notatum;* male 8 mm.; legs red, marked with yellow.
Characters: Trans. Amer. Ent. Soc., vol. 29, p. 175.

***concinnum** CRESSON, 1872. Texas (Belfrage). Tab. 2.
"Much like *simile*, differing principally by the color of the legs." (Cresson.)
The legs are fulvo-ferruginous.
*Cotype.*—Cat. No. 1773, U.S.N.M.

***consimile** ASHMEAD, 1896. Near Los Angeles, California (Davidson). Tab. 1.
Female 7 mm.
Parasite; *Torymus anthidii* Ashmead.
The nest is figured and described in Ent. News, 1896, p. 23.
*Type.*—Cat. No. 16698, U.S.N.M.

**cressonii** DALLA TORRE, 1896. Tab. 2.
New name for *venustum* Cresson, preoccupied.
Nest: Bull. Amer. Mus. Nat. Hist., vol. 12, (1906), p. 444, fig. 1.

**curvatum** SMITH, 1854. Georgia. Tab. 1.
This has been confused with *sayi* (*interruptum* Say).

***davidsoni** COCKERELL, 1904. Bear Valley, California (Davidson). Tab. 1.
Allied to *parvum*.
*Type.*—Cat. No. 9653, U.S.N.M.

***ehrhorni** COCKERELL, 1900. Mojave Desert, California (Ehrhorn). Tab. 1.
Belongs to subgenus *Anthidiellum*.
*Type.*—Cat. No. 5811, U.S.N.M.

***eiseni** COCKERELL, 1913. San José del Cabo, Lower California (Eisen). Belongs to *Anthidiellum*.
*Type.*—Cat. No. 16225, U.S.N.M.

**flavolineatum** SMITH, 1879. Oajaca, Mexico. Tab. 3.

**formosum** CRESSON, 1878. Colorado (Ridings). Tab. 2.
Possibly the male of *cressonii*.

**gabbii** CRESSON, 1878. Costa Rica (W. M. Gabb). Tab. 3.

***gilense** COCKERELL, 1897. West Fork of Gila River, New Mexico (Townsend). Tab. 1, 2.
Also in Texas.
Male: Ann. Mag. Nat. Hist., May 1900, p. 413.
*Type.*—Cat. No. 5810, U.S.N.M.

**gualanense** COCKERELL, 1912. Gualan, Guatemala (W. P. Cockerell).

**illustre** CRESSON (see under *Anthidium*). Nevada (Morrison). Tab. 2.

**impatiens** SMITH, 1879. "South Mexico." Tab. 3.

**interruptum** SAY, 1824. "Missouri."
Name preoccupied: = *sayi*.

***jugatorium** SAY 1824. "Missouri." Tab. 4.
Very close to *perpictum*, differing in color of tegulæ.

***larreæ** COCKERELL, 1897. Near Agricultural College, Mesilla Valley, New Mexico (Cockerell). Tab. 2.
Legs red. Relationships; Bull. Southern California Acad. Sci., Feb., 1904, p. 23.
*Type.*—Cat. No. 3507, U.S.N.M.

**lepidum** CRESSON, 1878. Georgia (Morrison). Tab. 2.
"Resembles *jugatorium* in ornamentation of abdomen" (Cresson).

***macrurum** COCKERELL, 1913. Federal District, Mexico (J. R. Inda).
*Type.*—Cat. No. 16226, U.S.N.M.

**mexicanum** CRESSON, 1878. Mexico (Sumichrast). Tab. 3.
Wings fuscous.

***notatum** LATREILLE, 1809. "Carolina." Tab. 2.
Redescribed by Cresson, Proc. Ent. Soc. Phila., vol. 2, 1864, p. 376.

**orizabæ** DALLA TORRE, 1896. Tab. 3.
New name for *A. atriventre* Smith, preoccupied.

***parvum** CRESSON, 1878. Colorado (Ridings). Tab. 1, 2.
"Marked very much like *simile*, but smaller" (Cresson).

***perpictum** COCKERELL, 1898. Ruidoso Creek, New Mexico (Wooton). Tab. 1.
*Type.*—Cat. No. 5807, U.S.N.M.
I have recently (Aug. 8, 1913) taken this at flowers of *Helianthus annuus*, at Boulder, Colorado.

**perpictum coloradense** SWENK, 1913. Colorado Springs, Colorado.

**perplexum** SMITH. See under *Anthidium*.

***provancheri** TITUS, 1906. Los Angeles County, California (Coquillett).
"Closely allied to *ulkei*, *ehrhorni*, and *simile*" (Titus).
*Type.*—Cat. No. 9033, U.S.N.M.

**pudens** CRESSON, 1879. Nevada (Morrison). Tab. 2.
"This may prove to be the female of *pudicum*" (Cresson).

***pudicum** CRESSON, 1879. Nevada (Morrison). Tab. 2.
Resembles *D. parvum*, but markings paler; perhaps not specifically distinct.
Female; Entomologist, May, 1907, p. 99.

***robertsoni** COCKERELL, 1904. Rock Creek, California (Davidson). Tab. 1.
Belongs to subgenus *Anthidiellum*.
*Type.*—Cat. No. 9654, U.S.N.M.

***sayi** COCKERELL, 1907. Tab. 4.
New name for *interruptum* Say, preoccupied.

**sayi xerophilum** COCKERELL, 1907. Mesilla, New Mexico (Cockerell).
A very red form.

***simile** CRESSON, 1864. "Mass., Conn." Tab. 2.

Varietal form or race in Texas; Proc. Ent. Soc. Washington, IX, p. 72.

**singulare** Cresson, 1879. Nevada (Morrison). Tab. 2.

"Easily recognized (female) by the dilated lateral margin of abdominal segments 2 to 4" (Cresson). First two abdominal segments with the yellow bands divided into spots.

**singulare perluteum** T. and W. Cockerell, 1904. Wilson's Peak, California (Davidson).

First two abdominal segments with the yellow bands deeply notched, but not divided.

**subparvum** Swenk, 1913. Pullman, Washington (C. V. Piper).

**tertiarium** Cockerell, 1906. Fossil in the Miocene shales of Florissant (Scudder.)

*__texanum__ Cresson, 1878. Texas (Belrage). Tab. 2.

Nest and female; Melander, Biol. Bull., 1902.

Allied to *concinnum*.

**toltecum** Cresson, 1878. Mexico (Sumichrast). Tab. 3.

*__ulkei__ Cresson, 1878. Utah (*Hy. Ulke*). Tab. 2, 4.

Comparison with *parvum;* Entom. News, 1909, p. 261.

*__ulkei perterritum__ Cockerell, 1913. Santa Fe, New Mexico (Cockerell).

**venustum** Cresson, 1878. Colorado (Ridings, Morrison).

Name preoccupied: = *cressonii*.

The following South American species are known to belong to *Dianthidium:*

*D. inerme* Friese.
*D. bertonii* Schrottky.
*D. zebratum* Schrottky.
*D. bicoloratum* Smith.
*D. bicoloratum tucumanum* Vachal.
*D. steloides* Spinola.
*D. confusum* Smith.
*D. indescriptum* Dalla Torre.
*D. nudum* Schrottky.
*D. vernoniæ* Schrottky.
*D. megachiloides* Holmberg.
*D. heathi* Cockerell.
*D. iheringi* Schrottky.
*D. gregarium* Schrottky.
*D. gregarium continuifasciatum* Strand.
*D. tigrinum* Schrottky.
*D. anisitsi* Schrottky.
*D. paraguayense* Schrottky.
*D. multiplicatum* Smith.
*D. lunatum* Smith.
*D. joergenseni* Friese (*bruchi* Schrottky).
*D. brethesi* Schrottky.
*D. catamarcense* Schrottky.
*D. autumnale* Schrottky.
*D. nectarinioides* Schrottky.
*D. multifasciatum* Strand.

*Anthidium rubripes* Friese, which Brethes (1909) referred to *Dianthidium*, is an *Anthidium*.

### Genus HYPANTHIDIUM Cockerell.

Second recurrent nervure passing well beyond second submarginal cell, as in *Dianthidium*, but feet with no pulvilli.

**aureocinctum** Cockerell, 1912. Mexico.

*__panamense__ Cockerell, 1913. Gatun, Canal Zone, Panama (A. H. Jennings.)

*Type.*—Cat. No. 16227, U.S.N.M.

The type of *Hypanthidium* is the South American *H. flavomarginatum* Smith.

### Genus HETERANTHIDIUM Cockerell.[1]

Second recurrent nervure meeting second transverse cubital, as in *Anthidium;* feet with pulvilli; end of male abdomen pointed. See also Ent. News, 1909, p. 261

*__chippewaense__ Graenicher, 1910. Indian village at juncture of the Lower Tamarack and St. Croix Rivers, Minnesota (Graenicher).

*Paratype.*—Cat. No. 14915, U.S.N.M.

**cockerelli** Titus, 1902. Rocky Ford (Gillette) and Virginia Dale (Titus), Colorado.

Described under *Protanthidium*.

**dorsale** Lepeletier, 1841. Georgia. This is the type of the genus.

Legs ferruginous; hair of thorax and head above rufous.

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[1] Entomological News, 1904, p. 292.

**harbecki** CRAWFORD. See under *Anthidium*.
***occidentale** CRESSON, 1868. New Mexico (S. Lewis).
Colorado (cf. Cresson).
**ridingsi** CRESSON. See under *Anthidium*.
***zebratum** CRESSON, 1872. Texas (Heiligbrodt).

### Genus PROTANTHIDIUM T. and W. Cockerell.

This is an Asiatic genus; the two American species (*cockerelli* and *chippewaense*) which have been referred to it belong to *Heteranthidium*.

### Genus TRACHUSA Jurine.

A genus of Europe, represented in California by a single species, which departs from typical *Trachusa*, and approaches *Dianthidium*, in the venation. In general, however, it is remarkably like the European *T. serratulæ*.

**perdita** COCKERELL, 1904. Tehachapi, California (Davidson).
Male about 12 mm.; abdomen black without light markings; clypeus and lateral face marks cream color.

### Genus LITHANTHIDIUM Cockerell.

**pertriste** COCKERELL, 1911. Fossil at Florissant, Colorado.

### Genus LITHURGUS Berthold.

Fox (1902) has proposed to separate the North American species as a genus *Lithurgopsis*, but this can hardly be maintained. For an account of the characters of various species of *Lithurgus*, see Trans. Amer. Ent. Soc., vol. 31 (1905), p. 333.

Typical *Lithurgus* has no pulvillus in either sex; the males of *Lithurgopsis* have a distinct pulvillus.

***apicalis** CRESSON, 1875. "Colorado, New Mexico (H. C. Yarrow, C. E. Aiken)."
Hair at end of abdomen fulvous.
***apicalis opuntiæ** COCKERELL, 1902. Mesilla Valley, New Mexico (Cockerell).
Hair at end of abdomen dark. Formerly confused with *gibbosus*.
***compressus** SMITH, 1853. "United States" (Doubleday).
Apparently the male of *gibbosus*.
***echinocacti** COCKERELL, 1898. La Cueva, Organ Mountains, New Mexico (Townsend.)
Visits *Echinocactus wislizenii*.
***gibbosus** SMITH, 1853. "United States."
Female with the facial prominence not at all bilobed.
**oblongus** Fox=*Megachile longula*.

*Lithurgus* is known from the European Miocene (*L. adamiticus* Heer). It is represented in South America by the following species:

*L. corumbæ* Cockerell.
*L. dubius* Sichel.
*L. laticeps* Friese.
*L. albiceps* Friese.
*L. huberi* Ducke.
*L. friesei* Ducke.
*L. rufiventris* Friese.
*L. pygmaeus* Friese.
*L. planifrons* Friese.
*L. neoqueenensis* Friese.
*L. osmoides* Friese.
*L. macroglossa* Friese.

# THE NOCTUID MOTHS OF THE GENERA PALINDIA AND DYOMYX.

By Harrison G. Dyar,
*Custodian of Lepidoptera, United States National Museum.*

These strikingly colored Noctuids have long been favorites with collectors. They are best known under the name *Palindia* of Guenée. The *Dyomyx* have been generally associated with the *Palindia*, and are apparently allied. *Dyomyx* has a very long third joint to the palpi and presents none of the modifications of the hind tibiæ of the male, so general in *Palindia*. Some of the species have been frequently interchanged between the genera.

The first species of *Palindia* made known were by Cramer, under the general terms *Phalæna Noctua* and *Phalæna Geometra*. Hübner ranged them in two genera, *Eulepidotis* and *Phrygionis*. The type of the latter is generally considered to be *cultaria* Hübner (=*politata* Stoll, not *politia* Cramer), the first species, a Geometrid. Of the former, the type is *ilyrias* Cramer, the first species, fixed by Butler (1892), a *Palindia*. Guenée next established *Palindia* and *Dyomyx*. Walker made no new genera in this group. Butler divided *Palindia* in three parts, using *Eulepidotis* for the green ones, *Palindia* for the white ones, and *Phrygionis* for the yellow ones. Bar placed them all in *Palindia*, included *Dyomyx* as closely related, if not a subgenus, but separated the species with curved outer line under the name *Calydia*. The species will be treated here as done by Guenée under two names, but it will be necessary to substitute the older *Eulepidotis* for *Palindia*.

Three species have been reported in the United States, *Eulepidotis dominicata* Guenée from southern Texas, where it may even be established, *E. micca* Druce, recently reported from Texas by Barnes and McDunnough, and *Dyomyx merricki* Holland from Pennsylvania, where it was probably accidentally imported on tropical fruit.

Nothing is known of the larvæ or life history of any of the rather numerous species. One hundred and three species are here considered of *Eulepidotis* and twenty of *Dyomyx*.

## Genus EULEPIDOTIS Hübner.

*Eulepidotis* Hübner, Verz. bek. Schmett., 1816, p. 291. Type, *illyrias* Cramer (recte *ilyrias*) (first species); *ilyrias* specified by Butler, Ent., 1892, p. 189.

*Palindia* Guenée, Spec. Gen., 1852, vol. 6, p. 274. Type, *hemileuca* Guenée (first species); *julianata* Stoll specified by Butler, Ent., 1892, p. 189.

*Calydia* Bar, Ann. Soc. Ent. France (5), 1875, vol. 5, p. 291. Type, *bourgaulti* Bar (first species); here specified.

### *Table of the species.*

| | | |
|---|---|---|
| 1. | Outer line strongly depressed, forming an arc from tornus to middle of costa. | 2 |
| | Outer line not so curved | 7 |
| 2. | Dark markings forming detached spots; angular-edged spots at apex, median area, and inner margin | 3 |
| | Without detached dark spots | 4 |
| 3. | Color pale ocher | *metalligera* Butler. |
| | Color white | *osseata* Bar. |
| 4. | A dark brown velvety shade beneath the outer arcuate line | 5 |
| | No dark shade beneath the outer arcuate line | 6 |
| 5. | Discal area violaceous and roseate; hind wing ocherous shaded | *ornata* Dognin. |
| | Discal area without violet tint; hind wing fuscous | *hemithea* Druce. |
| 6. | Orange ocher; vertical line within outer arcuate line catenulate, without bordering metallic scales | *bourgaulti* Bar. |
| | Dull ocher grayish; this line a row of pale spots, edged without by metallic blue scales | *norduca* Schaus. |
| 7. | Ground color not white; forewing crossed by 3 double-edged lines, or the basal one single | 8 |
| | Ground color not white; forewing crossed by 2 double-edged lines, the basal one of the normal 3 obsolete | 45 |
| | Ground color white; forewing with 3 bands converging on tornus, the two outer generally suffused to the margin, leaving a single oblique band across middle | 52 |
| | Ground color dark brown; a silvery white band or spots across middle of wing | 64 |
| | Ground color white; at least thorax and base of wings; markings vertical, or not of 3 bands converging on tornus | 67 |
| | Ground color pale yellow with 2 parallel dark lines perpendicular to inner margin and bent on costa | 74 |
| 8. | Lines regular, straight or curved, not crenulate or crumpled | 9 |
| | Lines crenulate or crumpled | 42 |
| 9. | Central line obsolescent, marked with metallic only on costa | 10 |
| | Central line developed like the others | 11 |
| 10. | Outer and inner lines straight | *junetta* Dyar. |
| | Outer and inner lines curved on costa | *magica* Dyar. |
| 11. | Ground color not green; subterminal metallic line present on forewing | 12 |
| | No metallic subterminal line except in species with green ground color | 26 |
| 12. | Hind wing orange or ocher, at least over disk | 13 |
| | Hind wing fuscous, or largely suffused, only apex sometimes orange | 20 |
| 13. | Hind wing without dark patch at apex | 14 |
| | Hind wing with dark patch at apex | 19 |
| 14. | Lines of forewing with linear metallic edges | 15 |
| | Lines of forewing with broad metallic edges | 16 |
| 15. | Mark on hind wing single, large, blue | *dives* Butler. |
| | Mark on hind wing of 2 oblique dashes and a patch of scales | *emilia* Bar. |
| 16. | Mark of hind wing single | 17 |
| | Mark of hind wing double | *stella* Bar. |

17. Metallic borders of lines leaden.......................................... 18
Metallic borders of lines, except subterminal, blue................ *susetta* Dyar.
18. Ground color yellowish orange........................................ *formosa* Bar.
Ground color reddish orange.................. *crocoptera* Felder and Rogenhofer.
19. Brighter orange, contrasted........................................ *corinna* Cramer.
Duller orange; fuscous markings more suffused.............. *prismatica* Dyar.
20. Thorax and base of forewing suffused with green.............. *transcendens* Dyar.
Thorax and base of forewing orange to fuscous brown.......................... .21
21. Apex of hind wing orange to the edge........................... *penumbra* Dyar.
Apex of hind wing, if orange marked, not to the edge.......................... 22
22. Thorax and base of forewing orange ocher........................... *regalis* Butler.
Thorax and base of forewing fuscous brown........................................ 23
23. Apex of hind wing with ocher patch; metallic lines of forewing distinct *selecta* Dyar.
Apex without ocher patch; metallic lines narrow, less distinct................ 24
24. Apex of forewing with orange patch........................... *austrina* Schaus.
Apex of forewing without such patch................................................ 25
25. Dull, minutely squamose-strigate; lines scarcely orange-filled....... *sabina* Bar.
Brighter, smoothly scaled; lines orange-filled.............. *caeruleilinea* Walker.
26. Lines broad, double-edged, filled with sordid orange shades.................. 27
Lines occluded or nearly so, narrow, without distinct double edges; forewing green........................................................................ 30
27. Inner line broad like the others, the 3 subparallel lines running to inner margin 28
Inner line reduced, single, the others tending to converge on tornus.......... 29
28. Wings mottled with green; no subterminal dots........................ *reticulata* Bar.
Wings not green; a row of subterminal dark dots.................. *mustela* Druce.
29. Small; smooth gray; a whitish zigzag subapical shade........... *addens* Walker.
Large; clouded; no subapical mark............................ *superior* Guenée.
30. Hind wing fuscous with green patch on margin .................... *anna* Dyar.
Hind wing broadly green, at least on disk ....................................... 31
31. Both wings with silvery submarginal line ........................................ 32
No metallic silvery submarginal line .............................................. 33
32. Silvery line broad, continuous..................................*argentilinea* Schaus.
Silvery line slender, broken into dashes..............................*reducens* Dyar.
33. Hind wing with point or short tail on margin, marked with black in fringe... 34
Hind wing without point marked in the fringe, smoothly rounded or bluntly angled........................................................................ 39
34. Wings beneath brown and ocher except near base.............................. 35
Wings beneath largely green.......................................................... 37
35. Submedian fold of hind wing with a brown ray; apex of hind wing generally with a distinct brown patch.............................................*viridissima* Bar.
Submedian fold of hind wing without a brown ray; no apical patch.......... 36
36. Smaller; markings of the wings beneath slight..........................*chloris* Bar.
Larger; markings of the wings beneath distinct....................*folium* Schaus.
37. Hind wing with subapical orange patch and orange at tornus................ 38
Hind wing without orange, all pure green above and below.....*glaucopasa* Dyar.
38. Wings below largely brownish; male without fovea in cell of hind wing. *ilyrias* Cramer.
Wings below clear green; male with transparent fovea in cell of hind wing. *sylpha* Dyar.
39. Smaller; hind wing with little orange and that faint............................ 40
Larger; hind wing with large sharply marked orange patch at apex and tornus.. 41
40. Hind wing with small silver patch before tornus...............*schedoglauca* Dyar.
Hind wing without this patch; a brown spot on margin............*holoclera* Dyar.

41. Hind wing with an angle on margin; no silvery dot; a brown streak on submedian orange area.................................................*stigmasticta* Dyar.
Hind wing without angle; a small silvery dot within the angle; no brown on submedian orange area.............................................*croceipars* Dyar.
42. Fore wing green.............................................................. 43
Fore wing dark, with white marks about middle of costa.................... 44
43. Hind wing fuscous, no green...........................................*atalanta* Bar.
Hind wing with green at tornus and margin...........................*erina* Dyar.
44. Lines of fore wing regularly spaced.....................................*delecta* Schaus.
Lines of fore wing with the two inner approximated.........*serpentifera* Brabant.
45. Inner line traceable by dots.................................................. 46
Inner line not traceable beyond costa........................................ 48
46. Costal edge marked with white, especially at inceptions of lines............... 47
No white on costal edge..........................*strixpuncta* Herrich-Schaffer.
47. Hind wing dull, violet patch not contrasted..............................*exra* Druce.
Hind wing bright; violet patch well contrasted.....................*hebe* Möschler.
48. Terminal space of clear pale yellow ground color............................ 49
Terminal space filled in with brown except on costa beyond outer line....... 50
49. Ground color very pale yellow.........................................*perducens* Walker.
Ground color distinctly straw yellow....................................*affinis* Schaus.
50. Transverse lines joined by a bar on inner margin.................*julianata* Stoll.
Transverse lines separate on inner margin.................................... 51
51. Fore wing yellow except terminal space...........................*juncida* Guenée.
Fore wing all shaded with brown.............................var. *mabis* Guenée.
52. Terminal area white.........................................................*geminata* Packard.
Terminal area brown, suffusing the two outer lines.......................... 53
53. Fringe brown...................................................................... 54
Fringe white, at least at base centrally....................................... 58
54. Marginal area broad, the bounding inner line inbent in the middle............ 55
Marginal area narrow, its bounding line nearly straight....................... 56
55. Submarginal dotted area of hind wing in orange, preceded by a minute dash. *fortissima* Dyar.
This area in ocher, preceded by a long dash.................*dominicata* Guenée.
56. Oblique band joining outer area on tornus.......................*persimilis* Guenée.
Oblique band joining inner margin, separate from outer area................. 57
57. Marginal patch of hind wing preceded by a black dash.............*nicæa* Druce.
This patch without preceding line, or very faintly...............*teligera* Brabant.
58. Marginal area inbent in middle; hind wing with no yellow except on margin... 59
Marginal area straight or nearly so; hind wing frequently suffused with yellow. 60
59. Middle band very broad, white area reduced to narrow band on costal wedge. *argyritis* Butler.
Middle band moderate; white area broad..............................*suppura* Dyar.
60. Hind wing with costal dark patch.........................................*electa* Dyar.
Hind wing without costal dark patch............................................ 61
61. Marginal patch of hind wing solid, vivid, in orange............................ 62
Marginal patch dilute, pale, the marginal dots relieved..............*candida* Bar.
62. Marginal band of fore wing rather broad...................................... 63
Marginal band of fore wing narrow...................................*santarema* Walker.
63. Band of fore wing running to costa before middle, well separated from base. *rectimargo* Guenée.
This band very oblique, joined to base by the costal dash.....*metamorpha* Dyar.
64. Inner band blue...................................*albata* Felder and Rogenhofer.
Inner band silvery white.......................................................... 65

65. Costal half of hind wing whitish..................................*ouocco* Dyar.
Costa of hind wing with central pale patch at most.............................. 66
66. Smaller; orange patches larger; submedian dark dash of hind wing generally doubled or hooked............................*guttata* Felder and Rogenhofer.
Larger; orange patches small; submedian dash of hind wing single.
*perlata* Guenée.
67. Outer portion of wings white like the inner........................................ 68
Outer portion of fore wing filled in with dark brown, sharply limited...,.... 70
68. Two straight lines on fore wing converging on tornus..............*detracta* Walker.
One angular line oblique on tornus, the others costal wedges or dots.
*testaceiceps* Felder and Rogenhofer.
Two irregular lines across wing, parallel, running to inner margin............ 69
69. Fringe on central third of outer margin of hind wing brown, but without preceding line.....................................................*alabastraria* Hübner.
Outer margin of hind wing with short, central, brown, preceding line.
*pulchella* Bar.
70. Hind wing with long brown bar preceding gray metallic area before marginal marking................................................................. 71
Hind wing with small black spot before metallic area, and a smaller dot near tornus.................................................................... 72
71. Base of fore wing white with costal dark patch and dot.........*hemileuca* Guenée.
Base of fore wing filled in with brown to vein 1.................*microleuca* Dyar.
72. Hind wing with no marginal ocellus..............................*vincentiata* Stoll.
Hind wing with marginal ocellus and white streak............................ 73
73. Termen divided in two colors by a wavy subterminal line............*ornata* Bar.
Termen all evenly dark, no subterminal line............*caudata* Herrich-Schäffer.
74. Inner line of irregular large purple blotches....................*hermura* Schaus.
Inner line fine and slender................................................ 75
75. Ground color pale yellow............................*modestula* Herrich-Schäffer.
Ground color darker yellow.......................................*micca* Druce.

### EULEPIDOTIS METALLIGERA Butler.

*Phrygionis metalligera* Butler, Trans. Ent. Soc. Lond., 1879, p. 32.
*Calydia metalligera* Druce, Biol. Cent.-Amer., Lep. Het., vol. 1, 1889, p. 316.

Described from the Amazons. Specimens are before me from Colombia, French Guiana, Panama, Costa Rica, and Mexico.

### EULEPIDOTIS OSSEATA Bar.

*Calydia osseata* Bar, Ann. Soc. Ent. France (5), vol. 5, 1875, p. 293.

Unknown to me in nature. Bar's figure differs from *metalligera* Butler only in being white instead of yellow.

### EULEPIDOTIS ORNATA Dognin.

*Calydia ornata* Dognin, Mém. Soc. Ent. Belg., vol. 18, 1911, p. 155.

I have a single specimen before me from Bolivia agreeing with Dognin's description.

### EULEPIDOTIS HEMITHEA Druce.

*Calydia hemithea* Druce, Biol. Cent.-Amer., Lep. Het., vol. 1, 1889, p. 316.

Described from Panama. I have two specimens from Chiriqui before me.

### EULEPIDOTIS BOURGAULTI Bar.

*Calydia bourgaulti* Bar, Ann. Soc. Ent. France (5), vol. 5, 1875, p. 292.
*Phrygionis setosa* Butler, Trans. Ent. Soc. Lond., 1879, p. 31.

Described from French Guiana. I have specimens before me from that locality and others from Panama.

### EULEPIDOTIS NORDUCA Schaus.

*Calydia norduca* Schaus, Ann. Mag. Nat. Hist. (7), vol. 8, 1901, p. 38.

The type is from Jalapa, Mexico. I have others from Mexico, Costa Rica, and Panama.

### EULEPIDOTIS JUNETTA Dyar.[1]

This species from Tabernilla, Canal Zone, Panama, will be more fully described in a forthcoming report dealing with the results of the Smithsonian Biological Survey of the Panama Canal Zone.

### EULEPIDOTIS MAGICA, new species.

Dark slaty brown, finely peppered over thorax and fore wings, the scales having bright tips as in *sabina* Bar, shading to orange brown over apex; three lines of metallic green, the inner bent subcostally, then slightly oblique, followed by brown; mesial line more oblique, lost below the subcosta except for a faint dark trace; outer line oblique above, less so below vein 5, running to tornus, preceded by orange at costa; a leaden subterminal line. Hindwing nearly black, without tail; three blue spots in a row along submedian fold, the middle one black outwardly, the outer marginal one nearly all black, raised; a slight black prominence on margin above this last spot. Expanse, 23–25 mm.

*Cotypes.*—One male, one female, No. 15697, U. S. Nat. Mus.; St. Jean and St. Laurent, Maroni River, French Guiana, October and November, 1904 (W. Schaus).

### EULEPIDOTIS DIVES Butler.

*Phrigionis dives* Butler, Trans. Ent. Soc. Lond., 1879, p. 30.
*Palindia dives* Druce, Biol. Cent.-Amer., Lep. Het., vol. 1, 1889, p. 317.

Three specimens are before me from French Guiana, identified by Schaus.

### EULEPIDOTIS EMILIA Bar.

*Palindia emilia* Bar, Ann. Soc. Ent. France (5), vol. 5, 1875, p. 299.

Described from French Guiana, whence I have two specimens and another from Dutch Guiana.

### EULEPIDOTIS FORMOSA Bar.

*Palindia formosa* Bar, Ann. Soc. Ent. France (5), vol. 5, 1875, p. 300.

I have two specimens from French Guiana, the type-locality.

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[1] Proc. U. S. Nat. Mus., vol. 47, 1914, p. 209.

### EULEPIDOTIS CROCOPTERA Felder and Rogenhofer.

*Palindia crocoptera* FELDER and ROGENHOFER, Reise *Novara*, Lep., pl. 111, fig. 18, 1872.

I have three specimens of this from French Guiana.

### EULEPIDOTIS SUZETTA, new species.

Yellow, unusually clear; lines straight, dark ocherous, edged on one side by a fine brown line, on the other by a broad band of metallic bluish scales; inner line with colors reversed; mesial line more oblique than the others; a subterminal leaden line preceded by a brown line. Hindwing clear yellow; a rounded metallic blue spot on submedian fold, well before margin, at about outer third of wing; on the margin three silvery patches, marked by a few brown scales, the lower one opposite the submedian patch is the largest. Expanse, 24 mm.

*Type.*—Male, Cat. No. 15698, U. S. Nat. Mus.; St. Jean, Maroni River, French Guiana, April, 1904 (W. Schaus).

The specimen bears a label "*corinna* Cr., fide B. M."; but Bar's identification must be respected since Cramer's figure is so poor as to be uncertain if considered alone.

### EULEPIDOTIS STELLA Bar.

*Palindia stella* BAR, Ann. Soc. Ent. France (5), vol. 5, 1875, p. 297.

I have no specimens of this species, which seems very distinct, judging from Bar's figure.

### EULEPIDOTIS CORINNA Cramer.

*Phalæna Noctua corinna* CRAMER, Pap. Exot., vol. 1, 1779, p. 47, pl. 29, fig. H.
*Palindia corinna* BAR, Ann. Soc. Ent. France (5), vol. 5, 1875, p. 296.
*Phrygionis quadrilineata* KAYE, Trans. Ent. Soc. Lond., 1901, p. 123.

I have specimens from Trinidad, British and French Guianas, and Venezuela.

### EULEPIDOTIS PRISMATICA, new species.

Dull ocher, shaded with sordid nearly all over the wings; lines double, the centers dull ocher, inner line blackish, outer metallic violet, but appearing dark leaden in most lights, inner line reversed; both mesial and outer lines bent more or less in the middle; reniform a dusky shade; submarginal line leaden; terminal row of dark dots. Hindwing with costa smoky, disk only dull orange; a curved streaked band with violet scales across disk; three silvery patches on margin preceded by black dots. Beneath rather uniformly light ocherous straw color. Expanse, 20–24 mm.

*Cotypes.*—One male, two females, Cat. No. 15699. U. S. Nat. Mus. St. Jean, Maroni River, French Guiana, July, 1904 (W. Schaus).

Close to *corinna* Cramer, but, I think, distinct. It is generally duller, less contrastingly colored, and beneath the uniform light ocherous tint is different from the bright yellow contrasted markings of *corinna*.

### EULEPIDOTIS TRANSCENDENS, new species.

Thorax, basal segment of abdomen, and basal space of fore wing pale glaucus green; fore wing lilacine brown, apical half yellow, forming a clear wedge on costa before outer line and a blotched area at apex; lines broad, double, orange filled, slender inner line dark brown, outer broad, metallic blue; subterminal line silvery; fringe dark. Hind wing nearly solidly fuscous; a yellow area in fringe below apex and at tornus; patch on submedian fold metallic blue, followed by minute lines to the silvery marginal patches, the lower of which has its black dots fused into a crescent. Expanse, 25–27 mm.

*Cotypes.*—Two males, one female, Cat. No. 15700, U. S. Nat. Mus.; St. Jean, Maroni River, French Guiana, July, 1904 (W. Schaus).

This species is abnormal in lacking entirely the hind tibial tufts of the male.

### EULEPIDOTIS PENUMBRA, new species.

Dark brown; forewing rather roughly scaled, apex yellowish; lines double but rather narrow, curved, orange brown, but slightly relieved from the ground; metallic edges blue, narrow, that of midline obsolete below subcosta; subterminal line leaden. Hindwing with clear yellow apex, involving the fringe, the rest of the wing of color of forewing, shading to blackish on costal half; two raised patches of scales on submedian fold, with blue metallic tint, the outer one marginal and followed by a second smaller spot above; a dark line from subcostal dark region to inner submedian spot. Expanse, 27 mm.

*Type.*—Female, Cat. No. 15701, U. S. Nat. Mus.; St. Jean, Maroni River, French Guiana, March, 1904 (W. Schaus).

### EULEPIDOTIS REGALIS Butler.

*Phrygionis regalis* BUTLER, Trans. Ent. Soc. Lond., 1879, p. 31, note.

I have one specimen from French Guiana, identified by Schaus.

### EULEPIDOTIS SELECTA, new species.

Forewing brown over orange under tint, which appears subapically in a triangular diffused area; lines orange brown, with slender dark inner edges and metallic blue outer ones (inner line reversed), inner and mesial lines straight, the mesial more oblique; outer line curved in upper half; subterminal line silvery; terminal dots black. Hindwing fuscous brown, a light patch near apex; disk with a reddish area, followed by a metallic blue band, then an area of black irrorations; three marginal silvery elongate patches with black dots. Beneath contrastingly marked, orange-yellow and fuscous, the apex of forewing broadly fuscous; hindwing with two streaks on costa. Expanse, 27 mm.

*Type.*—Female, Cat. No. 15702, U. S. Nat. Mus.; Rockstone, Essequibo River, Dutch Guiana, September, 1904 (W. Schaus).

Near *corinna* Cramer, more darkly shaded, the lines narrower and with slender metallic edges.

### EULEPIDOTIS AUSTRINA Schaus.

*Palindia austriana* SCHAUS, Ann. Mag. Nat. Hist. (8), vol. 7, 1911, p. 60.

The type and another specimen from the same locality are before me.

### EULEPIDOTIS SABINA Bar.

*Palindia sabina* BAR, Ann. Soc. Ent. France (5), vol. 5, 1875, p. 301.

Seven specimens from French Guiana are before me.

### EULEPIDOTIS CŒRULEILINEA Walker.

*Palindia cæruleilinea* WALKER, Cat. Brit. Mus., Lep. Het., part 15, 1858, p. 1768.
*Palindia corineta* FELDER and ROGENHOFER, Reise *Novara*, Lep., 1872, pl. 111, fig. 2.
*Palindia lucia* BAR, Ann. Soc. Ent. France (5), vol. 5, 1875, p. 300.

A long series from the Guianas, Venezuela, Panama, Costa Rica, and Mexico is before me.

### EULEPIDOTIS RETICULATA Bar.

*Palindia reticulata* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 249.
*Palindia diana* MÖSCHLER, Verh. zool.-bot. Ges. Wien, vol. 30, 1880, p. 394.

Ten specimens from French and Dutch Guiana are before me.

### EULEPIDOTIS MUSTELA Druce.

*Palindia mustela* DRUCE, Biol. Cent.-Amer., Lep. Het., vol. 2, 1889, p. 318.

Described from Mexico. I have three from there and one from Panama.

### EULEPIDOTIS ADDENS Walker.

*Palindia addens* WALKER, Cat. Brit. Mus., Lep. Het., part 15, 1858, p. 1768.

Described from Santo Domingo. I have three from Porto Rico, one from Santa Lucia, and one from Dominica.

### EULEPIDOTIS SUPERIOR Guenée.

*Palindia superior* GUENÉE, Spec. Gen., vol. 6, 1852, p. 278.
*Palindia dewitzii* MÖSCHLER, Abh. Senck. nat. Ges., vol. 14, 1886, p. 196.
*Palindia deva* DRUCE, Biol. Cent.-Amer., Lep. Het., vol. 1, 1889, p. 320.

The description of *superior* is without locality; *dewitzii* is from Porto Rico and *deva* from Mexico and Panama. I have a long series from Mexico, Costa Rica, and Venezuela, none from the Antilles, though Möschler's description leaves no doubt of the identity of *dewitzii*. The species varies considerably in shading. Generally the ground color is uniform, but occasionally the terminal space is paler and without the purple shading, and again it is markedly darker than the rest of the wing.

### EULEPIDOTIS ANNA, new species.

Green; apex of abdomen fuscous; forewing green, costal edge brown; three lines, slender, brown, oblique, the outer curved and doubled; fringe brown. Hindwing brown, shading paler on costa; a green streak each side of submedian fold, and a semicircular green patch on outer margin. Beneath pale, with brown shadings, no green. Expanse, 24 mm.

*Type.*—Female, Cat. No. 15703, U. S. Nat. Mus.; St. Jean, Maroni River, French Guiana, July, 1904 (W. Schaus).

### EULEPIDOTIS ARGENTILINEA Schaus.

*Palindia argentilinea* SCHAUS, Proc. U. S. Nat. Mus., vol. 30, 1906, p. 110.

Only the unique type is before me.

### EULEPIDOTIS REDUCENS, new species.

Bright grass green, costa narrowly orange-brown, with blackish dots toward apex; inceptions of the three lines on costa brown, with dark edges; lines subparallel, approximate, bent subcostally, all running to inner margin, the mesial and outer ones approaching each other a little, all the lines narrower and less intense below; a subterminal silvery line, narrow and cut by the veins. Fringe brown tipped. Hindwing whitish on costal third, with subterminal silvery line as on fore wing; a slight prominence in the margin at vein 3 with a black dot preceded by silver and a black marginal line; a small speck on vein 2 before margin, from which proceeds a trace of a dusky outer line. Beneath silky whitish, with green tint by transparency. Expanse, 30 mm.

*Type.*—Female, Cat. No. 15703, U. S. Nat. Mus.; Suapure, Venezuela, April, 1899 (E. A. Klages).

### EULEPIDOTIS VIRIDISSIMA Bar.

*Palindia viridissima* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 248.

A series from French Guiana is before me, and one specimen from Venezuela.

### EULEPIDOTIS CHLORIS Bar.

*Palindia chloris* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 249.

I identify as this a single specimen from Venezuela. Probably only a variety of the preceding, as originally suggested by Bar.

### EULEPIDOTIS FOLIUM Schaus.

*Palindia folium* SCHAUS, Ann. Mag. Nat. Hist. (8), vol. 7, 1911, p. 61.

The type and two other specimens from Costa Rica are before me.

### EULEPIDOTIS ILYRIAS Cramer.

*Phalaena Bombyx ilyrias* CRAMER, Pap. Exot., vol. 1, 1779, p. 15, pl. 10, fig. E.
*Phalaena ilyraria* FABRICIUS, Ent. Syst., vol. 3, 1792, pp. 2, 138.
*Eulepidotis illyiaria* HÜBNER, Verz. bek. Schmett., 1816, p. 291.
*Palindia ilyrias* GUENÉE, Spec. Gen., vol. 6, 1852, p. 278.
*Palindia ilyrias* WALKER, Cat. Brit. Mus., Lep. Het., part 12, 1857, p. 859.
*Palindia ilyrias* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 246.

A series is before me from the Guianas and Costa Rica, showing the two customary varieties with a small and a large brown patch on the fore wing.

### EULEPIDOTIS SYLPHA Dyar.

This will be more fully described in my fourth paper on Mexican Lepidoptera to be published in the present volume of the Proceedings of the United States National Museum. The two types are before me—a male from Costa Rica and female from Mexico.

### EULEPIDOTIS GLAUCOPASA Dyar.

This also will be considered in my fourth Mexican paper. Five specimens are before me, all from Mexico.

### EULEPIDOTIS SCHEDOGLAUCA, new species.

Grass green; fore wing with the costa very narrowly brown; lines slender, brown, straight, slightly widened and luteous filled on costa, converging a little in the direction of tornus; costal area of hind wing shaded with orange; outer margin entire, without modification or marginal mark; a spot of raised scales before the margin, black within, silver without; tornus and fringe at submedian touched with orange; a terminal black line, touched with silver; fringe interlined with green and tipped with brown. Beneath greenish, washed over with brown; two curved brown lines on fore wing. Expanse, 27 mm.

*Cotypes.*—Male and female, Cat. No. 15705, U. S. Nat. Mus.; St. Jean, Maroni River, French Guiana, July, 1904 (W. Schaus).

Another male from Aroa, Venezuela (Schaus collection), is a little larger, otherwise identical.

### EULEPIDOTIS HOLOCLERA, new species.

Green; forewing with pale brown edge of costa linear; lines slender, brown, straight, without costal widening, but minute light dots at costa, converging a little in the direction of tornus; fringe green. Hindwing with large orange area at apex and costa; a small red-brown incision at submedian fold, followed by a narrow terminal line and one minute black dot. Beneath green at the bases of both wings, shaded with rusty outwardly; forewing with one faint outer line or clouded brown area. Expanse, 32–34 mm.

*Cotypes.*—One male, two females, Cat. No. 15706, U. S. Nat. Mus.; St. Jean, Maroni River, French Guiana, July, 1904 (W. Schaus).

Though so nearly related to *E. schedoglauca*, the present species has no hair tufts on the hind tibiæ of the male. These tufts are large and conspicuous in *schedoglauca*.

### EULEPIDOTIS STIGMASTICTA Dyar.

This will be more fully mentioned in my fourth Mexican paper. Two cotypes, both females from Mexico, are before me.

### EULEPIDOTIS CROCEIPARS, new species.

Fore wing green; the three lines of a duller shade, slightly converging in the direction of tornus; fringe tipped with brown. Hindwing bright orange; a green ray on each side of submedian fold, the upper one spreading out on the margin and inclosing a small raised silvery spot with black scales on the edges; margin entire, with three silvery and one black dots in the green area. Abdomen green at base, orange on terminal half. Below green near bases of the wings, then orange, the apex of forewing shaded with brown. Male without tuft on hind tibia. Expanse, 40 mm.

*Type.*—Male, Cat. No. 15707, U. S. Nat. Mus.; Rio Janeiro, Brazil (Schaus collection).

### EULEPIDOTIS ATALANTA Bar.

*Palindia atalanta* Bar, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 249.

This species is not before me, but should be readily recognizable from Bar's excellent figure.

### EULEPIDOTIS ERINA, new species.

Green; abdomen green above at the base, fuscous posteriorly. Fore wing mossy green; three crossbands double, brown-filled, wavy or subcrenulate, close and all terminating perpendicular to inner margin, curved on costal half; inner line angularly bent in the middle; a fourth wavy shaded subterminal line; a row of irregular blotches through cell outwardly to margin; a row of terminal white dots; fringe brown. Hindwing blackish fuscous; a green ray before submedian fold and triangular patch on margin beyond it, containing a blackish speck; a narrow outer curved line running near margin toward tornus. Beneath shaded with fuscous brown, especially outwardly; both wings with two curved fuscous bands. Expanse, 27 mm.

*Type.*—Female, Cat. No. 15708, U. S. Nat. Mus.; St. Jean, Maroni River, French Guiana, April, 1904 (W. Schaus).

### EULEPIDOTIS DELECTA Schaus.

*Palindia delecta* Schaus, Ann. Mag. Nat. Hist. (8), vol. 7, 1911, p. 59.

The type and another specimen from Costa Rica are before me.

### EULEPIDOTIS SERPENTIFERA Brabant.

*Palindia serpentifera* Brabant, Le Nat. (2), vol. 22, 1909, p. 178.

Four specimens from French Guiana are before me, identified by Mr. Schaus.

### EULEPIDOTIS EZRA Druce.

*Palindia ezra* Druce, Biol. Cent.-Amer., Lep. Het., vol. 2, 1898, p. 499.

Described from Mexico. I have five specimens from there, one from Costa Rica, one from Panama, and two from Venezuela. Possibly it is not more than racially distinct from *hebe* Möschler of the Antilles. The two are certainly very close.

### EULEPIDOTIS HEBE Möschler.

*Palindia hebe* Möschler, Abh. Senck. Nat. Ges., vol. 14, 1886, p. 195.

Eight specimens are before me from Cuba.

### EULEPIDOTIS STRIÆPUNCTA Herrich-Schäffer.

*Palindia striæpuncta* HERRICH-SCHÄFFER, Corr.-Bl., zool.-min. ver. Regensb. vol. 22, 1869, p. 153.

*Palindia variabilis* MÖSCHLER, Abh. Senck. Nat. Ges., vol. 14, 1886, p. 194.

*Palindia* var. *obscura* MÖSCHLER, Abh. Senck. Nat. Ges., vol. 14, 1886, p. 195.

Closely allied to *hebe*, apparently a degenerate offshoot from it. The colors are dulled and very variable, the white costal ornamentation obsolete, the markings of hind wing reduced. I have five specimens from Cuba.

### EULEPIDOTIS PERDUCENS Walker.

*Palindia perducens* WALKER, Cat. Brit. Mus., Lep. Het., part 15, 1858, p. 1767.

Described from Jamaica. I have no specimens.

### EULEPIDOTIS AFFINIS Schaus.

*Palindia affinis* SCHAUS, Ann. Mag. Nat. Hist. (8), vol. 7, 1911, p. 60.

The continental representative of the Antillean *perducens*. I have seven from Costa Rica, one from Panama, and one from Venezuela.

### EULEPIDOTIS JULIANATA Stoll.

*Phalaena Geometra julianata* Stoll, Suppl. Cramer's Pap. Exot., 40, pl. viii, fig. 4, 1791 (written *juliata* in index, p. 383).

*Palindia julianata* GUENÉE, Spec. Gen., vol. 6, 1852, p. 277.

*Palindia egala* WALKER, Cat. Brit. Mus., Lep. Het., part 33, 1865, p. 807.

*Palindia julianata* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 5.

*Palindia julianata* BUTLER, Ent., 1892, p. 190.

Unknown to Guenée, but well figured by Bar. Butler runs this in with *juncida* Guenée = *aglaura* Bar, wrongly, I think. He does not mention *mabis* Guenée in this connection, as he had evidently misidentified the name (see *Dyomyx fumata* Felder and Rogenhofer), apparently from following Walker.[1] Seventeen specimens are before me from French Guiana, one from Venezuela, and one from Mexico, the latter an aberration with purple shading filling in the basal space up to the central line.

### EULEPIDOTIS JUNCIDA Guenée.

*Palindia juncida* GUENÉE, Spec. Gen., vol. 6, 1852, p. 277.

*Palindia mabis* GUENÉE, Spec. Gen., vol. 6, 1852, p. 277.

*Palindia thecloides* WALKER, Cat. Brit., Mus., Lep. Het., part 12, 1857, p. 851.

*Palindia aglaura* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 7.

*Palindia julianata*, vars. *juncida* and *aglaura* BUTLER, Ent., 1892, p. 190.

This species varies in the amount of purple shading. In typical *juncida* there is none, except in the terminal space; it gradually increases as a general smoky suffusion of the pale parts until the wing is wholly and uniformly shaded (var. *mabis*). Walker apparently misidentified *mabis*, as he describes his *thecloides*, which is the same thing, immediately after. Bar recognized the variability of the species, but did not recognize it as *juncida* Guenée, which he refers to as unknown to him. Butler also recognized the variation, but went a step too far by including also *julianata* Stoll. I have 135 specimens before me from Brazil, the Guianas, Venezuela, Panama, Costa Rica, and Mexico.

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[1] Cat. Brit. Mus., Lep. Het., part 12, 1857, p. 850.

### EULEPIDOTIS GEMINATA Packard.

*Palindia geminata* PACKARD, First Rep. Peabody Acad. Sci., 1869, p. 64.
*Palindia regina* DRUCE, Ann. Mag. Nat. Hist. (6), vol. 4, 1889, p. 93.

I have four specimens before me from Ecuador, Colombia, and Costa Rica. Dr. A. S. Packard's type was collected by the Smithsonian Expedition to South America in 1867 "on the route from Quito across the Andes, down the Napo River, and along the river Maranon." Druce described from Ecuador.

### EULEPIDOTIS FORTISSIMA, new species.

Shining white; abdomen dull ocher on posterior half; head and collar brown. Forewing with broad, dark brown band, widest on costa and running to tornus, contiguous on its lower half to the outer brown area; this is broad, bent toward base in middle, terminated by a double line, dull ocher filled below; a vague pale submarginal shade, preceded by a darker area. Hindwing yellowish, with a white ray on either side of submedian fold; a large black patch at apex; a short tail on outer margin, preceded by a black spot with white dash on one side and marginal white line on the other, preceded by a brownish area with scattered black scales, and before this a very short brown line at end of outer white ray. Expanse, 40–44 mm.

*Cotypes.*—Two males, one female, Cat. No. 15709, U. S. Nat. Mus.; Rio Janeiro, Brazil (Schaus collection); Omai, British Guiana (Schaus collection); Juan Vinas, Costa Rica, February (W. Schaus).

Near *dominicata* Guenée, but distinctly larger and the ornamentation of the hind wing different.

### EULEPIDOTIS DOMINICATA Guenée.

*Palindia dominicata* GUENÉE, Spec. Gen., vol. 6, 1852, p. 276.

Described from Brazil. I have specimens from there, the Guianas, Venezuela and Costa Rica. This species has been recorded from the United States,[1] but on what material is unknown to me. I should rather expect *rectimargo* or *electa* to occur with us, as these species are in my experience much more abundant than *dominicata* and extend farther north.

### EULEPIDOTIS PERSIMILIS Guenée.

*Palindia persimilis* GUENÉE, Spec. Gen., vol. 6, 1852, p. 276.

I have a single specimen from Brazil, the type-locality.

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[1] Bull. 44, U. S. Nat. Mus., 1893, p. 361.

### EULEPIDOTIS NICÆA Druce.

*Palindia nicæa* DRUCE, Ann. Mag. Nat. Hist. (7), vol. 5, 1900, p. 518.

This is unknown to me, but appears from the description close to the following.

### EULEPIDOTIS TELIGERA Brabant.

*Palindia teligera* BRABANT, Le Nat. (2), vol. 23, 1910, p. 31.
*Palindia vivida* DOGNIN, Het. nouv. l'Amer. du sud, vol. 6, 1912, p. 20.

Brabant described from Venezuela, Dognin from Paraguay. I have five specimens from Venezuela agreeing perfectly with the descriptions of both authors.

### EULEPIDOTIS ARGYRITIS Butler.

*Eulepidotis argyritis* BUTLER, Trans. Ent. Soc. Lond., 1879, p. 29.

Described from Brazil. I have one from Venezuela and eight from Mexico, one of the latter compared with Butler's type by Mr. Schaus.

### EULEPIDOTIS SUPPURA Dyar.

This will be described more fully in my fourth Mexican paper. I have six cotypes from Mexico and Venezuela.

### EULEPIDOTIS ELECTA Dyar.[1]

This will be mentioned more in detail in my forthcoming Panama report. Twenty-six specimens are before me from Venezuela, Panama, Costa Rica, and Mexico.

### EULEPIDOTIS RECTIMARGO Guenée.

*Palindia rectimargo* GUENÉE, Spec. Gen., vol. 6, 1852, p. 276.

Thirty-five specimens are before me from Brazil, Paraguay, the Guianas, Venezuela, Panama, Costa Rica, and Mexico.

### EULEPIDOTIS METAMORPHA, new species.

Very similar to *rectimargo*, differing principally in the direction of the crossband, which runs obliquely from tornus to costa at basal third and is joined completely to the base by the costal dash. Hind wing with the mark fainter, its preceding dash very distinct. Expanse, 30 mm.

*Type.*—Male, Cat. No. 15110, U. S. Nat. Mus.; Matanzas, Cuba, November, 1902 (W. Schaus).

### EULEPIDOTIS SANTAREMA Walker.

*Palindia santarema* WALKER, Cat. Brit. Mus., Lep. Het., part 33, 1865, p. 806.

This species is not before me.

### EULEPIDOTIS CANDIDA Bar.

*Palindia candida* BAR, Ann. Soc. Ent. France, (5), vol. 6, 1876, p. 8.

This is not before me, but Bar's figure leaves no room for doubt as to the identity of this form.

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[1] Proc. U. S. Nat. Mus., vol. 47, 1914, p. 210.

### EULEPIDOTIS ALBATA Felder and Rogenhofer.

*Palindia albata* Felder and Rogenhofer, Reise *Novara*, Lep., 1872, pl. 111, fig. 1.

*Palindia magdalensis* Bar, Ann. Soc. Ent. France, (5), vol. 6, 1876, p. 434.

Ten specimens are before me from French Guiana.

### EULEPIDOTIS OUOCCO, new species.

Small; costo-subapical orange spot large; costa alternating orange and metallic blue with a white spot near the middle; sub-basal line with white central spot; marginal line widely expanded in the middle. Hind wing with costal half whitish, the rest brown with faintly indicated purplish outer half-band. Fringe white, interrupted below the middle by a small dark speck. Expanse, 15 mm.

*Type.*—Cat. No. 15711, U. S. Nat. Mus.; St. Jean, Maroni River, French Guiana, July, 1904 (W. Schaus).

### EULEPIDOTIS GUTTATA Felder and Rogenhofer.

*Palindia guttata* Felder and Rogenhofer, Reise *Novara*, Lep., 1872, pl. 111, fig. 3.

*Palindia micra* Bar, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 433.

Forty-three specimens are before me from French Guiana, Panama, Costa Rica, and Nicaragua.

### EULEPIDOTIS PERLATA Guenée.

*Palindia perlata* Guenée, Spec. Gen., vol. 6, 1852, p. 279.

*Palindia spectabilis* Walker, Cat. Brit. Mus., Lep. Het., part 15, 1858, p. 1767.

Forty-one specimens are before me from Brazil, French Guiana, Panama, Costa Rica, and Nicaragua. Very close to *guttata*, but differing in many details. The two silvery spots are not infrequently confluent, occasionally forming a band, which in one specimen is narrow, almost as in *albata*.

### EULEPIDOTIS DETRACTA Walker.

*Palindia detracta* Walker, Cat. Brit. Mus., Lep. Het., part 12, 1857, p. 847.

Described from Brazil. I have eight from Brazil and Paraguay.

### EULEPIDOTIS TESTACEICEPS Felder and Rogenhofer.

*Palindia testaceiceps* Felder and Rogenhofer, Reise *Novara*, Lep., 1872, pl. 111, fig. 16.

*Palindia albula* Bar, Ann. Soc. Ent. France, (5), vol. 6, 1876, p. 20.

I have nine specimens from Venezuela, Panama, and Costa Rica.

### EULEPIDOTIS ALABASTRARIA Hübner.

*Eulepidotis alabastraria* Hübner, Verz. bek. Schmett., 1816, p. 291.

*Eulepidotis alabastriaria* Hübner, Zutr. exot. Schmett., 1818, p. 22, figs. 311–312.

*Palindia punctangulata* Walker, Cat. Brit. Mus., Lep. Het., part 12, 1857, p. 848.

*Palindia alabastraria* Butler, Ent., 1892, p. 190.

Thirty-six specimens are before me from Brazil, French Guiana, Venezuela, Panama, Costa Rica, and Mexico. This name was introduced into the North American faunal list by Hulst as a Geometrid,[1] lately corrected by Swett.[2]

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[1] See Bull. 52, U. S. Nat. Mus., 1903, p. 292, No. 3486.

[2] Can. Ent., vol. 39, 1907, p. 142.

### EULEPIDOTIS PULCHELLA Bar.

*Palindia pulchella* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 245.

This is not before me. Butler makes it a synonym of *alabastraria*, but none of my series of that species show the little bar close to margin of hind wing seen in Bar's figure, so I hold the name separate.

### EULEPIDOTIS HEMILEUCA Guenée.

*Palindia hemileuca* GUENÉE, Spec. Gen., vol. 6, 1852, p. 275.

One specimen from Brazil is before me.

### EULEPIDOTIS MICROLEUCA, new species.

As in *hemileuca* Guenée, except that the basal white space of fore wing is filled in with black and brown scales nearly down to vein 1. In *hemileuca* this space is white with a black spot on costa and dot below. Expanse, 29 mm.

*Type.*—Male, Cat. No. 15712, U. S. Nat. Mus.; Rio Janeiro, Brazil (Schaus collection).

This may be an aberration of *hemileuca*, but my series of both forms is so limited that I can form no idea of the range of variation.

### EULEPIDOTIS VINCENTIATA Stoll.

*Phalæna Geometra vincentiata* STOLL, Suppl. Cramer's Pap. Exot., 1791, p. 39, pl. 8, fig. 3.
*Palindia vincentiata* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 9.

This is not before me.

### EULEPIDOTIS ORNATA Bar.

*Palindia ornata* BAR, Ann. Soc. Ent. France (5), part 6, 1876, p. 11.

I have seen no specimens of this species.

### EULEPIDOTIS CAUDATA Herrich-Schäffer.

*Palindia caudata* HERRICH-SCHÄFFER, Exot. Schmett., 1853, fig. 136.
*Palindia caudata* WALKER, Cat. Brit. Mus., part 12, 1857, p. 850.

Described from Surinam. I have a single specimen from Panama.

### EULEPIDOTIS HERMURA Schaus.

*Palindia hermura* SCHAUS, Journ. N. Y. Ent. Soc., vol. 7, 1898 (June), p. 119.
*Palindia evadens* DRUCE, Biol. Cent.-Amer., Lep. Het., vol. 2, 1898 (August), p. 500.

Thirteen specimens are before me from Mexico, Costa Rica, and Venezuela.

### EULEPIDOTIS MODESTULA Herrich-Schäffer.

*Palindia modestula* HERRICH-SCHÄFFER, Corr.-bl. zool.-min. Ver. Regensb., vol. 22, 1869, p. 153.
*Palindia modestula* MÖSCHLER, Abh. nat. Senck. Ges., vol 14, 1886, p. 193.

I have eight specimens from Cuba.

### EULEPIDOTIS MICCA Druce.

*Palindia micca* DRUCE, Biol. Cent.-Amer., Lep. Het., vol. 1, 1889, p. 319.

Eleven specimens are before me from Mexico, Costa Rica, and Venezuela. This is the continental form of *modestula* Herrich-Schäffer.

## UNPLACED SPECIES.

### PALINDIA PRIMULINA Druce.

*Palindia primulina* DRUCE, Ann. Mag. Nat. Hist., (7), vol. 5, 1900, p. 518.

Evidently a peculiar and characteristic species, unlike anything known to me. The following is Mr. Druce's description:

*Male.*—Head, antennæ, collar, tegulæ, thorax and abdomen pale primrose-color; the under side of the thorax, abdomen, and legs white. Primaries and secondaries pale primrose-yellow; primaries, the costal margin edged with white, three curved chrome-yellow bands cross the wing from the costal to the inner margin, the first two bands nearest the base, the third beyond the cell; the marginal line white, with minute black dots; the fringe chrome-yellow; secondaries with a few metallic scales near the anal angle, above which is a short chrome-yellow line; the under side of both wings pale primrose-yellow.

Expanse, 1 inch.

*Hab.*—Colombia, Valparaiso (*Mus. Druce*).

### PALINDIA REFLEXA Herrich-Schäffer.

*Palindia reflexa* HERRICH-SCHÄFFER, Corr.-Blatt zool.-min. Ver. Regensb., vol. 22, 1869, p. 154.

Easily to be recognized by the very peculiar secondary sexual character of the male, a round, white, hairy lappet on the costa above. I have seen nothing at all approaching such a structure. The following is Herrich-Schäffer's description:

114) *reflexa HS.* 489/625. foem.—449/1047 mas.—Kleiner als *corinna*, Hfl auf R 3 sehr schwach geeckt. Rostbraun, Vfl mit 2 ganz geraden, gegen den IR divergirenden QStreifen, von 1/3 und 2/3 des VR und weisser W der Franzen. Auf den Hfl nur ein weisser Schrägstreif in Z 1 a als innere Begrenzung eines rostrothen Fleckes. Beim kleineren Manne sind beide Streife der Vfl undeutlicher, weniger divergirend, der VR aber hinter der Mitte in einen grossen, halbscheibenförmigen, weissen, rothbraungewimperten Lappen nach oben umschlagen.

Recently Mr. Schaus and the writer, in considering the identification of Herrich-Schäffer's name, have concluded that it is probably not a *Palindia* at all, or even a Noctuid, but is an earlier name for *Paridnea holophæalis* Ragonot, a Pyralid of the subfamily Chrysauginæ.

### PALINDIA STRIATARIA Cramer.

*Phalæna Geometer striataria* CRAMER, Pap. Exot., vol. 4, 1782, p. 125, pl. 355, fig. F.
*Palindia striata* GUENÉE, Spec. Gen., vol. 6, 1852, p. 278.
*Palindia striatia* HERRICH-SCHÄFFER, Corr.-Blatt zool.-min. Ver. Regens., vol. 22, 1869, p. 153.

Unknown to Guenée (1852), who placed it in *Palindia* from his interpretation of Cramer's figure. Also unknown to Walker,[1] who follows Guenée. Herrich-Schäffer had a specimen from Cuba which he describes at some length. Bar, overlooking Herrich-Schäffer's work, considers *striataria* "une *Palindidæ* bien douteuse."[1] The species is very strongly marked and should be easily recognizable.

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[1] Cat. Brit. Mus., Lep. Het., part 12, 1857, p. 850.

### PALINDIA SCITA Walker.

*Palindia scita* WALKER, Char. undes. Lep. Het., 1869, p. 39.

Sir George Hampson has kindly drawn my attention to this description. It appears to represent a form quite unknown to me. No locality is given.

## Genus DYOMYX Guenée.

*Dyomyx* GUENÉE, Spec. Gen., vol. 6, 1852, p. 281. Type *cimolia* Guenée (first species); *cimolia*, here designated.

*Dyomix* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 436.

*Table of the species.*

1. Hind wing with short tail on outer margin.................... 2
   Hind wing without tail, at most wavy or slightly angulated.................... 5
2. Discal mark narrow, lunate; white mark on inner margin situated beyond the fourth (bent) line.................... 3
   Discal mark wide, oval; white mark on inner margin, if present, following the third (straight) line.................... 4
3. Larger, browner; median line of hind wing bordered with orange; submarginal silver line slight.................... *albistriga* Schaus.
   Smaller, grayer; median line of hind wing not distinctly bordered with orange; submarginal silvery line distinct.................... *egista* Bar.
4. Larger, browner; white mark on inner margin distinct........ *consequens* Dyar.
   Smaller, grayer; mark on inner margin faint, yellowish........ *merricki* Holland.
   Larger, grayer; no light mark on inner margin.. *fumata* Felder and Rogenhofer.
5. Fore wing without eye-spot.................... *inferior* Herrich-Schäffer.
   Fore wing with round eye-spot above inner margin6.................... 6
6. Three inner lines straight, oblique.................... 7
   These lines wavy or broken.................... 14
7. Lines relieved on a uniform ground.................... 8
   A solid dark shade between mid and inner lines.................... 12
8. Fore wing with terminal dark line relieved by narrow white or yellow lines on each side; median line of hind wing reduced to a dash.................... 9
   Terminal dark line relieved only by faint pale shades.................... 10
9. Fore wing uniform purplish; lines with yellow edges.................... *guenei* Bar.
   Fore wing purple-blue on inner half; lines without yellowish edges *megalops* Guenée.
10. Subterminal line of forewing pale, distinct throughout.................... *janus* Bar.
    Subterminal line faint or obsolete.................... 11
11. Mesial line of hind wing beneath even; pale line before terminal line of forewing above, dotted.................... *ocala* Schaus.
    Mesial line of hind wing beneath crenulate; pale subterminal line not dotted... 12
12. Ocellus large; reniform free from mesial line; inner line of hind wing parallel to and near outer.................... *egistoides* Bar.
    Ocellus small; reniform contiguous to mesial line; inner line of hind wing remote from outer line, curved, obsolescent.................... *herberta* Dyar.
13. Shade between mid and inner lines uniform in width.................... *jonesi* Schaus.
    This shade cut off above inner margin.................... *zates* Druce.

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[1] Ann. Soc. Ent. France (3), vol. 5, 1875, p. 290.

14. Median area with dark filling between the lines.............................. 15
Median area without dark filling.............................. 17
15. Dark area from inner to outer line and continued in a patch to outer margin
*ora* Dyar.
Dark area confined between the inner and median lines.................... 16
16. Hind wing olive yellow with dark brown angled area from base; marginal mark large, silvery, with black striæ............................ *juno* Möschler.
Hing wing brown; marginal mark slight, rather inconspicuous.. *volcanica* Schaus.
17. Hing wing with subocellate black spots on outer margin.................... 18
Hind wing without such spots, all fuscous with a narrow orange terminal edge
*ancea* Cramer.
18. Small; hind wing with single marginal ocellus.................. *placida* Schaus.
Large; hind wing with three marginal black ocellate dots....... *cimolia* Guenée.

### DYOMYX ALBISTRIGA Schaus.

*Palindia albistriga* SCHAUS, Ann. Mag. Nat. Hist. (8), vol. 7, 1911, p. 58.

I have the type and two other specimens, all from Costa Rica.

### DYOMYX EGISTA Bar.

*Dyomix egista* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 439.

I have six from British Guiana, Venezuela, Panama, and Costa Rica.

### DYOMYX CONSEQUENS Dyar.

This will be more fully described in my fourth Mexican paper. I have five cotypes from Mexico, Panama, and Venezuela.

### DYOMYX MERRICKI Holland.

*Palindia merricki* HOLLAND, Ent. News, vol. 13, 1902, p. 172.
*Palindia merricki* DYAR, Proc. Ent. Soc. Wash., vol. 14, 1912, p. 194.

Nine specimens are before me, all from Venezuela. The species was described from Pennsylvania, presumably from a stray specimen.

### DYOMYX FUMATA Felder and Rogenhofer.

*Palindia fumata* FELDER and ROGENHOFER, Reise *Novara*, Lep., 1872, pl. 111, fig. 17.
*Eulepidotis mabis* BUTLER (not Guenée), Trans. Ent. Soc. Lond., 1879, p. 29.
*Palindia mabis* DRUCE (part, not Guenée), Biol. Cent.-Amer., Lep. Het., vol. 1, 1889, p. 317.

This is not before me. Butler misidentified Guenée's *mabis*, apparently by following Walker's arrangement in the British Museum. Druce quoted the synonymy from Butler, though he probably had the true *mabis* before him.

### DYOMYX INFERIOR Herrich-Schäffer.

*Palindia inferior* HERRICH-SCHÄFFER, Corr. Bl., zool.-min. Ver. Regensb., vol. 22, 1869, p. 153.
*Dyomyx lineata* Druce, Biol. Cent.-Amer., Lep. Het., vol. 1, 1889, p. 320 (female).

Seven specimens are before me from Brazil, Panama, Costa Rica, and Mexico. Druce figures as male and female two different species. I restrict the name to the female figured in the Biologia, plate 29, fig. 25.

### DYOMYX GUENEI Bar.

*Dyomix guenei* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 442.

This is not before me. Bar's figure seems excellent.

### DYOMYX MEGALOPS Guenée.

*Dyomyx megalops* GUENÉE, Spec. Gen., vol. 6, 1852, p. 282.

I have not seen specimens. Guenée's figure is very sketchy, but probably recognizable.

### DYOMYX JANUS Bar.

*Dyomix janus* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 441.

Not known to me in nature.

### DYOMYX OCALA Schaus.

*Dyomyx ocala* SCHAUS, Ann. Mag. Nat. Hist. (8), vol. 7, 1911, p. 61.

The male type is before me. Mr. Schaus had associated with it another specimen as the female, but I consider this specimen to belong to the next species.

### DYOMYX EGISTOIDES Bar.

*Dyomix egistoides* BAR, Ann. Soc. Ent. France (5), vol. 6, 1876, p. 440.

A single female from Costa Rica is before me, agreeing well with Bar's characterization. It is mentioned above under *ocala*.

### DYOMYX HERBERTA, new species.

*Dyomyx lineata* DRUCE male (not female), Biol. Cent.-Amer., Lep. Het., 1889, pl. 29, fig. 24.

Brown, with faint purple irridescence over whole of fore wing, very faint on hindwing; lines slender, straight; subbasal half line, to vein 1, parallel to inner line, which runs from inner fifth of costa to inner third of inner margin; mesial line a little broader and less rigid than the other, slightly bent at median vein, touching inner side of small black ocellus on vein 1, which has white pupil, orange ring and brown outer ring; reniform vague, rather narrow, lunate, defined by inner and outer curved lines; outer line bent above vein 7, lost below 2, a brown marginal line, edged on both sides by pale lines. Hindwing with a line across disk, running close to margin, twice angled but not dentate, followed by a narrow dull orange streak and a blue-gray powdery area, which runs upward to about vein 5; two distant narrow white marginal lines; a small black dot between them opposite the outer angle of the middle line. This spot has an orange edging but is scarcely ocellate. Beneath a common mesial curved crenulate line, the hind wing with a straight shaded arc within it. Expanse, 43 mm.

*Cotypes.*—Two females, No. 15713, U. S. Nat. Mus.; St. Jean, Maroni River, French Guiana, April, 1904 (W. Schaus); Sixola River, Costa Rica, March, 1907 (W. Schaus).

### DYOMYX JONESI Schaus.

*Dyomyx jonesi* Schaus, Journ. N. Y. Ent. Soc., vol. 6, 1898, p. 120.
*Dyomyx obliquata* Schaus, Ann. Mag. Nat. Hist. (8), vol. 7, 1911, p. 62.

I have the unique types of *jonesi* from Brazil and *obliquata* from Costa Rica. Both are males and almost identical.

### DYOMYX ZATES Druce.

*Dyomyx zates* Druce, Biol. Cent.-Amer., Lep. Het., vol. 2, 1898, p. 500.

Two specimens are before me from Costa Rica.

### DYOMYX ORA Dyar.

To be more fully described in my fourth Mexican paper. I have a female from Mexico and another from Panama. This is not improbably an ornate variety of *D. cimolia* Guenée.

### DYOMYX JUNO Möschler.

*Dyomyx juno* Möschler, Abh. Senck. Nat. Ges., vol. 14, 1886, p. 197.

This is not before me.

### DYOMYX VOLCANICA Schaus.

*Dyomyx volcanica* Schaus, Journ. N. Y. Ent. Soc., vol. 6, 1898, p. 119.

The type and three other Mexican specimens are before me and two from Costa Rica.

### DYOMYX PLACIDA Schaus.

*Dyomyx placida* Schaus, Ann. Mag. Nat. Hist. (7), vol. 8, 1901, p. 39.

Six specimens are before me from Mexico, including the type. In one specimen the whole median space is ocherous.

### DYOMYX CIMOLIA Guenée.

*Dyomyx cimolia* Guenée, Spec. Gen., vol. 6, 1852, p. 282.
*Dyomyx pavo* Walker, Cat. Brit. Mus., Lep. Het., part 15, 1858, p. 1769.

Two specimens from Mexico are before me.

### DYOMYX ANCEA Cramer.

*Phalæna Noctua ancea* Cramer, Pap. Exot., vol. 4, 1782, p. 72, pl. 324, fig. G.
*Platyja*[1] *ancea* Hübner, Verz. bek. Schmett., 1816, p. 268.
*Dyomyx ancea* Guenée, Spec. Gen., vol. 6, 1852, p. 282.
*Dyomyx ancea* Walker, Cat. Brit. Mus., Lep. Het., vol. 12, 1857, p. 854.

Unknown to me except by Cramer's figure. The figure is bad, but seems nearest to *cimolia* Guenée of anything before me. I have so few *cimolia* that I can not form a good idea of the extent of its variation.

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[1] The type of *Platyja* Hübner must be taken to be *umminea* Cramer (first species), designated by Hampson (Moths of India, vol. 2, 1894, p. 539).

# NEW GENERA AND SPECIES OF AMERICAN BRACHYRHYNCHOUS CRABS.

By Mary J. Rathbun,

*Assistant Curator of Marine Invertebrates, United States National Museum.*

The forms here described belong to the group formerly known as the Catometopa or Grapsoidea. The type-specimens of three of the species are in the Museum of Comparative Zoology and were kindly lent for description through Dr. Walter Faxon; paratypes of the same as well as types of the remaining species are in the United States National Museum.

## FAMILY GONEPLACIDÆ.

### Subfamily CARCINOPLACINÆ.

### TRIZOCARCINUS,[1] new genus.

*Type of the genus.*—*Trizocarcinus dentatus* (Rathbun).

Carapace deep, subquadrilateral, broader than long, with little distinction of regions, convex fore and aft and from side to side. Fronto-orbital border about three-fourths of the greatest width of the carapace; antero-lateral borders arched, dentate. Front square-cut, straight, between one-third and one-fourth the width of the carapace, faintly notched in the middle, deeply separated from the supra-orbital angles. Upper margin of orbit with two distinct notches. Basal segment of antenna short, the flagellum standing loosely in the orbital hiatus. The antennules fold transversely. Buccal cavity increasing in width distally, maxillipeds widely gaping, their merus-joint with concave anterior margin, the antero-external lobe projecting forward not outward. Efferent branchial channels well defined. A stridulating ridge formed of parallel striæ runs obliquely backward from the antero-external angle of the buccal cavity; it is played upon by a short ridge on the merus of the cheli-

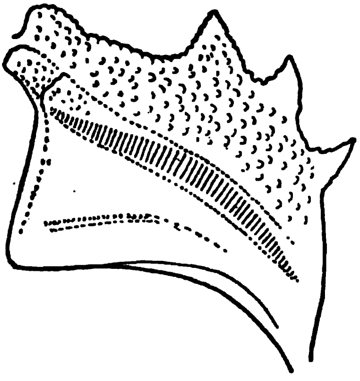

Fig. 1.—Trizocarcinus dentatus, ventral view of left side of carapace of male type, showing stridulating ridge, × 5.

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[1] Τρίζω, to creak, to grate; Καρχινος, crab.

peds equal, much more massive than the legs. In both sexes all seven abdominal segments are distinct and in the male the third segment covers the whole width of the sternum between the bases of the last pair of legs.

This genus is closely related to *Carcinoplax*[1] of the Indo-Pacific region, but differs chiefly in the form and disposition of the maxillipeds, the separation of the front from the orbit, and the presence of stridulating apparatus.

### TRIZOCARCINUS DENTATUS (Rathbun).

Plate 1.

*Carcinoplax dentatus* Rathbun, Proc. U. S. Nat. Mus., vol. 16, 1893, p. 243.

*Type-locality.*—Gulf of California, lat. 29° 40′ N.; long. 112° 57′ W., 76 fathoms, green mud, temperature 59° F., station 3016, U. S. Fisheries steamer *Albatross.*

*Type.*—Cat. No. 17462, U.S.N.M.

*Distribution.*—Gulf of California, 30 to 76 fathoms, green and gray mud, temperature 59° to 62° F.

The stridulating ridge on the pterygostomian region is crossed by about 70 fine striæ. A short, complementary ridge exists on the lower proximal margin of the inner surface of the arm and is crossed obliquely by 10 or 11 striæ.

## Subfamily PRIONOPLACINÆ.

### CYRTOPLAX,[2] new genus.

*Type of the genus.*—*Cyrtoplax spinidentata* (Benedict).

Carapace much broader than long, convex longitudinally and transversely. Regions well marked. Antero-lateral margins arcuate, dentate; postero-lateral margins converging. Fronto-orbital width three-fifths of width of carapace. Front advanced, lobes arcuate, separated only by a furrow from the orbital margin. Eyestalks tapering, corneæ small. Basal joint of antenna rather wide, inner angle just touching the front; flagellum standing in the orbital hiatus. Buccal cavity widening distally; maxillipeds gaping, merus broader than long. Chelipeds stout, unequal, wrists subtriangular in dorsal aspect, bispinose; palms high, fingers strongly deflexed. Legs long and slender; dactylus of last pair upcurved. The first and third abdominal segments of the male do not cover the sternum; the third, fourth, and fifth segments are fused.

This genus is much further removed than *Eucratopsis* from the Xanthid genus *Panopeus.* The carapace is much broader than in *Eucratopsis,* the eyestalks are slenderer, the eyes smaller, and the base of the male abdomen wider, but the first segment does not cover the sternum; the slender, deflexed fingers of the chelæ, and the strongly upcurved dactyli of the last pair of legs also separate the genus from *Eucratopsis*.

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[1] Milne Edwards, Ann. Sci. Nat., ser. 3, vol. 18, 1852, p. 164 (128).

[2] *Κυρτός*, convex; *πλάξ*, anything flat and broad, carapace.

### CYRTOPLAX SPINIDENTATA (Benedict).

Plate 2.

*Eucratoplax spinidentata* Benedict, Johns Hopkins Univ. Circ., vol. 11, 1892, p. 77.

*Eucratopsis spinidentata* Rathbun, Bull. U. S. Fish Comm. for 1900, vol. 2, 1901, p. 11.

*Type-locality.*—Jamaica.

*Type.*—Cat. No. 17219, U.S.N.M.

*Distribution.*—Jamaica; Porto Rico; Trinidad.

## CHASMOPHORA,[1] new genus.

*Type of the genus.*—*Chasmophora macrophthalma* (Rathbun).

Carapace very broad, subcylindrical, very convex longitudinally, much less so transversely; antero-lateral margin short, dentate. Fronto-orbital border about four-fifths the width of the carapace. Front separated from the orbital angle by a furrow. Eyes stout, filling the orbit; lower margin of orbit with a large outer sinus. Basal joint of antennæ not reaching the front, flagellum standing in the orbital hiatus. Buccal cavity widening anteriorly, entirely filled by the outer maxillipeds; distal angle of merus of maxillipeds prominent. Right cheliped of medium size; left not known. Legs slender. First segment of abdomen of female very broad, but not covering the whole width of the sternum; third segment narrower. It is probable that in the male these segments have a similar relation to the sternum.

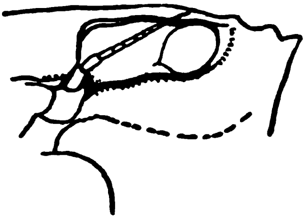

Fig. 2.—Chasmophora macrophthalma, anterior view of orbit of type female, showing hiatus, in which lies the antennal flagellum, × about 20.

Near *Euryplax* Stimpson,[2] in which the antennal flagellum is widely removed from the orbit by a large process of the basal joint.

### CHASMOPHORA MACROPHTHALMA (Rathbun).

*Eucratopsis macrophthalma* Rathbun, Proc. U. S. Nat. Mus., vol. 21, 1898, p. 601, pl. 43, figs. 3 and 4.

*Type-locality.*—Panama Bay, lat. 7° 56′ 00″ N.; long. 79° 41′ 30″ W., 51.5 fathoms, green mud, station 2805, U. S. Fisheries steamer *Albatross*.

*Type.*—Cat. No. 21591, U.S.N.M.

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[1] *Χάσμα*, an opening; φορά, an orbit.

[2] Ann. Lyc. Nat. Hist. N. Y., vol. 7, 1850, p. 60.

## Family GRAPSIDÆ.

### Subfamily GRAPSINÆ.

### PLANES MARINUS, new species.

Plate 3.

*Type-locality.*—At sea, west of Lower California, in lat. 23° 49′ N.; long. 127° 50′ W.; D. D. Raulet, collector.

*Type.*—Male, Cat. No. 6065, Mus. Comp. Zoöl. One male, 1 female, paratypes, Cat. No. 22833, U.S.N.M.

*Dimensions.*—Male type, length 17.6 mm., width 19.3 mm., width of front, 10 mm.

Carapace convex antero-posteriorly and from side to side; surface covered with punctæ and fine reticulations; coarser striæ cross the anterior half transversely and nearly all the branchial region obliquely. Surface of front covered with short striæ and minute granulation; free edge arcuate and faintly bilobed, each lobe appearing in front view slightly bilobed; edge a raised finely granulated rim; post-frontal lobes low. Antero-lateral margins convex, with one blunt tooth behind the tooth at the angle of the orbit; postero-lateral margins nearly straight, convergent.

Chelipeds equal, massive; upper and lower margins of arm transversely striated, inner expansion irregularly denticulated; outer surface of wrist finely striated, tooth at inner angle blunt; surface of palms nearly smooth, shining, punctate, upper surface rounded, covered with finely granulated longitudinal lines which become oblique proximally. Fingers stout, prehensile edges narrowly gaping, dentate, a larger tooth at middle of fixed finger.

Legs short and broad; third foot one and one-half times as long as carapace; merus of third pair three-fifths as broad as long; dactyli short and stumpy, armed with coarse spines.

Many species of *Planes* have been described in the past, all of which are referable to variations of *P. minutus;*[1] but this form appears to be distinct. It has a great resemblance to *Pachygrapsus* also, and forms a link between the two genera.

From *Planes minutus* it differs in its broader carapace, somewhat depressed about the middle instead of uniformly convex; in the postero-lateral margins being nearly straight as in *Pachygrapsus,* not arcuate as in *Planes minutus;* in the more extensive striation of the dorsal surface; in the broader basal joint of the antenna; the broader merus-joint of the outer maxilliped, both its inner and outer lobes being more strongly developed; in the feebler dentation of the distal end of the inner expansion of the arm.

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[1] *Cancer minutus* Linnaeus, Syst. Nat., ed. 10, 1758, vol. 1, p. 625.

Our species resembles *Pachygrapsus crassipes* Randall[1] but the carapace is narrower and more convex, the post-frontal lobes lower, the lateral tooth not acute nor prominent, the postero-lateral margins less convergent, dorsal striæ finer and more broken, those of the branchial region less extensive, palm without a definite marginal line above, last four segments of the abdomen of the male more regularly triangular.

### Subfamily VARUNINÆ.

#### CYRTOGRAPSUS ALTIMANUS, new species.

Plate 4.

*Type-locality.*—San Matias Bay, Patagonia; Hassler Expedition.

*Additional locality.*—Rio Grande do Sul, Brazil.

*Type.*—Male, Cat. No. 6126, M.C.Z. Two male paratypes in U. S. National Museum, Cat. No. 22835.

*Dimensions.*—Length of carapace of type male 16.8 mm., width of same, 18.4 mm.

This species while closely related to *C. angulatus* Dana,[2] which inhabits the same region, is much smoother and less ornate so that there is no likelihood of their being confused.

The carapace is not strongly areolated though the regions are well defined; the gastric region lacks the beaded transverse ridge characteristic of the older species. The surface is densely covered with fine depressed granules and somewhat less numerous punctæ; it appears almost smooth to the naked eye, while in *angulatus* the surface is obviously roughened with coarser granules. As to shape, the carapace has no sharp lateral angles, the antero-lateral margins are shorter than in *angulatus*, and the postero-lateral margins are longer and subparallel to each other. The antero-lateral margins have four teeth, including the orbital tooth, but they are small, especially the last two, and do not project beyond the marginal line; the intervals between the teeth diminish successively in length. There is no indication of a postero-lateral tooth.

The front is relatively wider than in *angulatus* and is feebly emarginate at the middle; the orbits are correspondingly smaller.

The outer maxillipeds have much the same shape in the two species, but in *altimanus* they are shorter and wider and the gape narrower.

The palms in the adult male are much higher in our species, especially at the distal end, and the movable finger is strongly deflexed; the immovable finger is nearly horizontal; there is a triangular space between the fingers for their proximal half only.

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[1] Journ. Acad. Nat. Sci. Phila., vol. 8, 1839 (1840), p. 127.

[2] Proc. Acad. Nat. Sci. Phila., vol. 5, 1851, p. 250; Crust. U. S. Expl. Exped., vol. 1, 1852, p. 352; atlas, 1855, pl. 22, fig. 6a–e.

Legs narrower than in *angulatus*, second and third pairs subequal; propodal joint and proximal part of terminal joint of first three pairs fringed with hair on the posterior margin; last two joints and distal part of carpal joint of last pair fringed with hair on both margins.

The abdomen of the male is narrower and more oblong than in *angulatus*, and the appendages of the first segment slenderer.

### PLATYCHIROGRAPSUS TYPICUS, new species.

Plate 5.

*Aspidograpsus typicus* KRØYER, MS., Copenhagen Museum.

*Platychirograpsus spectabilis* RATHBUN, Proc. U. S. Nat. Mus., vol. 22, 1900, p. 279 (part); not *P. spectabilis* de Man, 1896.[1]

*Type-locality.*—Macuspana River, Montecristo, Tabasco, Mexico; 140 miles from the sea, altitude over 100 feet; collected by E. W. Nelson and E. A. Goldman, Biological Survey, U. S. Department of Agriculture; 1 male.

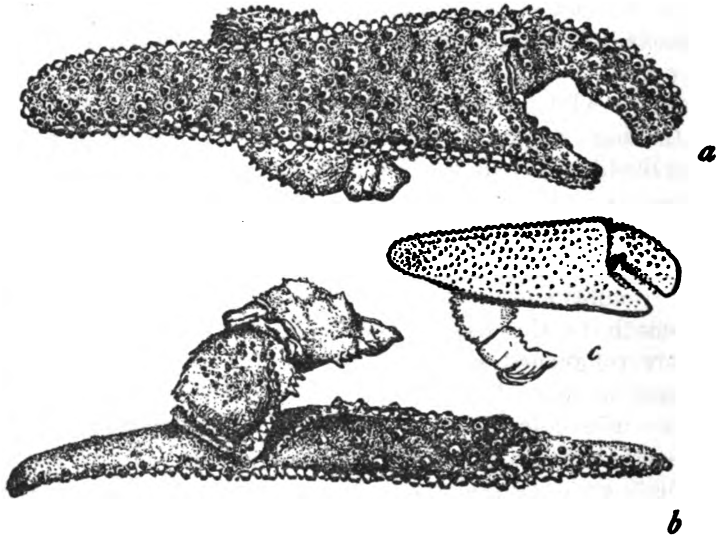

FIG. 3.—PLATYCHIROGRAPSUS TYPICUS. *a*. OUTER SIDE OF LARGE CHELA OF MALE IN HALIFAX MUSEUM, NAT. SIZE. *b*. UPPER VIEW OF SAME, NAT. SIZE. *c*. OUTER SIDE OF LARGE CHELA OF SMALL MALE FROM MEXICO, CAT. NO. 19863, × 1¼.

*Additional localities.*—Mexico; received from the exhibit by Mexico at the World's Columbian Exposition; 1 male. Gulf of Mexico; 1 male (Copenhagen Mus.). One large claw from an unknown locality (Halifax Mus.).

*Type.*—Cat. No. 23761, U.S.N.M.

*Dimensions.*—Male type, median length of carapace 42.5 mm., width 51 mm. Male from Mexican exhibit, length 27.2 mm., width

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[1] Zool. Anz., 1896, No. 506, p. 292, text fig.; Jahrb. Hamburg. Wiss. Anst., vol. 12, 1896, p. 97, pl. 2, figs. 4, *4a*, *4b*, *4d*; pl. 3, fig. *4c*.

32.5 mm. As 4 specimens from different localities in Mexico agree in presenting certain characters which separate this form from the African *P. spectabilis* de Man, it seems best to consider it as a distinct species.

The fourth tooth of the lateral margin is farther back than in *spectabilis* and the postero-lateral margins behind this point are less convergent and more nearly parallel.

The margin of the front is more distinctly 4-lobed and the median sinus is larger and more U-shaped.

The dorsal surface of the carpus is not oblong but of nearly the same length and width.

The merus and carpus joints of the ambulatory legs are narrower and their sides more nearly parallel.

## Subfamily SESARMINÆ.

### SESARMA (SESARMA) VERLEYI, new species.

Plate 6.

*Type-locality.*—Jamaica: Mulgrave (a small village in the Cockpit country near Ipswich, St. Elizabeth); 1 female collected by Miss Verley and received through Mr. P. W. Jarvis.

*Type.*—Cat. No. 24940, U.S.N.M.

*Dimensions.*—Female type, length of carapace 20 mm., width 22.8 mm., fronto-orbital width 16.5 mm., width of front 9.1 mm.

Carapace strongly narrowed anteriorly, convex fore and aft, regions and suprafrontal lobes fairly well marked; of the latter the outer pair are narrower than the inner pair and their anterior margin more strongly marked. Anterior part of carapace granulated, postero-lateral area finely striated.

The lower margin of the front forms two prominent lobes in dorsal view. The sides are oblique and the angles rounded off.

Upper margin of orbit directed outward and forward, outer angle broad and obtuse, the margin between it and the lateral tooth convex. This tooth is subrectangular with thickened tip.

Chelipeds of female narrow. Outer surface of arm and wrist crossed by short lines of granules, upper and outer margins rough with short oblique and parallel lines of granules, inner margin irregularly spinulous. Palms longer than wide, sparingly covered with depressed granules, more numerous above and toward the carpus, where they are arranged somewhat in rows. Fingers as long as the middle length of the palm, prehensile edges irregularly toothed except the distal third, which has a straight horny edge, tips curved toward each other.

Legs unusually long; the third leg is three and one-fifth times as long as the carapace, its merus is four times as long as wide. The legs (as well as the carapace) are nearly naked, only the margins of the last two joints (proximal end of the propodus excepted) bordered with short hairs with a few longer ones intermingled. The carpus has two prominent lines of granules on the upper surface, the posterior of which is continued somewhat obliquely on the next joint near its margin.

### SESARMA (SESARMA) JARVISI, new species.

Plate 7.

*Type-locality.*—Jamaica: Mount Diablo, St. Ann's; 1 male.

*Type.*—Cat. No. 24941, U.S.N.M.

*Dimensions.*—Type male, length of carapace 10.7 mm., greatest width 12.7 mm., anterior width 10.7 mm., width of front 5.2 mm.

Carapace narrowed anteriorly, considerably flattened; regions and suprafrontal lobes well marked, outer pair of lobes very narrow. Surface irregularly punctate and sparingly covered with tubercles, each of which bears the stumps of a tuft of hair. The oblique ridges usually found on the branchial regions are few and are broken into short irregular lines. Lateral tooth blunt.

The front diminishes in width below, the lower margin is convex in front view and bilobed in dorsal view.

Chelipeds not much enlarged. The outer surface of arm and wrist are finely rugulose, margins of arm finely granulate or denticulate and not prominent. The chelæ are elongate (the specimen is perhaps not full grown); manus rough with a few scabrous granules outside, upper margin a sharp crenulated ridge. Fingers irregularly toothed within, nearly meeting; upper surface of dactylus finely spinulous, almost to the tip.

Legs very slender, surface rough, sparingly hairy, spine of merus acuminate. Third leg about two and one-half times as long as carapace, its merus a little over three times as long as wide.

### SESARMA (HOLOMETOPUS) TAMPICENSE, new species.

Plate 8.

*Type-locality.*—Tampico, Mexico; Dr. Edward Palmer; June 1, 1910. "Lives in the soft mud of the river banks"; 4 males.

*Type.*—Cat. No. 45794, U.S.N.M.

*Dimensions.*—Type male, length 16.1 mm., greatest width (at base of second leg) 17.3 mm., width between outer angles of orbit 17.2 mm., width of front 9.4 mm., height of front measured from middle lobes 2 mm., extreme length of propodus of cheliped 13.7 mm., height of palm 8.4 mm., length of propodal finger along prehensile edge 6 mm., length of dactylus along upper margin 8.5 mm., length of propodus of third leg 11.8 mm., greatest width of same 4.2 mm.

Carapace perceptibly wider than long, of nearly even width throughout, though widening slightly behind. Surface coarsely punctate at the middle, finely punctate on the branchial and intestinal regions, the punctæ more or less connected by fine grooves; surface of frontal region and antero-lateral angles finely granulate; postero-lateral grooves fine.

Supra-frontal lobes deeply separated, the median groove larger than the lateral grooves; middle pair of lobes transversely arcuate; outer pair narrower, oblique, trending forward toward the orbit. Front relatively broad and low, about 5 times as wide as high, sides vertical, lower margin arcuate in front view, sinuous in dorsal view, surface concave in both directions. Upper margin of orbit nearly straight, up to the short, acute tooth at the outer angle of the orbit.

Merus of cheliped covered with granulated rugæ on its outer face; lower outer margin with a well-marked subdistal tooth; tooth on upper margin nearly obsolete; inner margin denticulate, distally expanded and bearing a large tooth. Upper surface of carpus similar to outer surface of merus. Palm massive in the full-grown male, as high as its horizontal length, lower margin arcuate, upper margin marked by interrupted lines of granules; outer surface covered with fine, depressed granules, inner surface with much larger granules on the more elevated portion. Fingers rather long and slender, for the genus, gaping in the male except at the tip; prehensile edges dentate, with 2 or 3 teeth enlarged on each finger.

Legs of moderate length, the third pair about twice as long as the carapace; merus joints about two and three-fourths times as long as wide, converging slightly from the middle to the distal end.

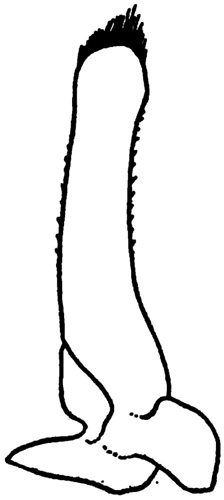

FIG. 4.—SESARMA (HOLOMETOPUS) TAMPICENSE, VENTRAL VIEW OF LEFT APPENDAGE OF FIRST ABDOMINAL SEGMENT OF MALE, × 10.′

Side margins of male abdomen sinuous. Appendages of first segment widened behind the tips, which are transverse.

Allied to *S. cinereum* (Bosc)[1] and *S. miersii* Rathbun.[2] It differs from both in the front having parallel sides instead of widening below, in the fingers gaping, in the male appendages transversely, instead of obliquely, cut at the tip. From *S. cinereum* it differs also in its narrower carapace, without scattered tufts of hair, longer fingers, and narrower male abdomen; from *S. miersii* in the relatively smooth palms, those of *miersii* being coarsely granulate.

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[1] *Grapsus cinereus* Bosc, Hist. Nat. Crust., vol. 1, 1802 (an X), p. 204, pl. 5, fig. 1.

[2] *Sesarma* (*Holometopus*) *miersii* Rathbun, Proc. Biol. Soc. Washington, vol. 11, 1897, p. 91.

## Family OCYPODIDÆ.

### Subfamily OCYPODINÆ.

### UCA MONILIFERA,[1] new species.

Plate 9.

*Eurychelus monilifer* L. AGASSIZ, MS. label.

*Type-locality.*—Guaymas, Mexico; Capt. C. P. Stone, U. S. N., collector, 1859.

*Type.*—Male, Cat. No. 1578, M. C. Z.; 1 male paratype in U. S. National Museum, Cat. No. 22180.

*Dimensions.*—Length of carapace of type male 28.7 mm., width at antero-lateral angles 45.4 mm.

This is the Pacific representative of the well-known fiddler crab with narrow front and broad fingers, *Uca maracoani* (Latreille)[2], which is distributed on the Atlantic coast of South America from Cayenne to Rio de Janeiro.

*U. monilifera* is considerably larger than *maracoani*, as the carapace of a large specimen of the latter measures 22×34 mm. There is no raised or granulated line bounding the dorsal plane on either side, but the dorsal rounds smoothly into the lateral surface. As in *maracoani* the anterior margin of the carapace or superior margin of the orbit is transversely sinuous, forming a triangular tooth at the antero-lateral angles, and the front between the eyes is extremely narrow and spatuliform, its median furrow linear and not reaching the broadest part of the spatula.

The lower margin of the orbit is deeply crenated or turreted throughout.

The large cheliped of the male is much smoother than in the Atlantic form. The inner border of the arm has a large laminar expansion directed upward, edge arcuate, denticulate. The wrist is more elongate than in *maracoani*. The tubercles of the palm are few and indistinct. Fingers quite smooth except at the margins and at the base of the dactylus, where there are a few depressed tubercles. On the immovable finger there is, as in *maracoani*, a raised line just above the lower margin and continued backward on the palm; there is, however, no broad lobe or tooth on the proximal half of the prehensile edge. The movable finger has a different shape from that of the allied species; while the upper margin is a regular and moderate curve, the prehensile edge is concave for its basal three-eighths, then straight to near the tip, forming a small tooth at the meeting of the two lines; this brings the widest part of the finger just proximal to its middle. In *maracoani*, the widest part of the finger is near its distal third, and the whole of the distal half is much wider than in the new species. The spiniform finger tips are not strongly bent in *monilifera*.

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[1] I have adopted the specific name used by Prof. Louis Agassiz on a Museum label, but hitherto unpublished.

[2] *Ocypode maracoani* Latreille, Hist. Nat. Crust., vol. 6, 1803 (an XI), p. 46.
*Gelasimus Maracoani* Milne Edwards, Ann. Sci. Nat., ser. 3, vol. 18, 1852, p. 144 [108], pl. 3, figs. 1-1b.

The ambulatory legs are almost bare except the dactyli.

The chief difference in the form of the male abdomen of the two species lies in the penultimate segment: in *monilifera* it is less than twice as wide as it is long; in *maracoani* just twice as wide as long.

### UCA MUSICA, new species.

Plate 10.

*Gelasimus gibbosus* STREETS (not Smith), Bull. U. S. Nat. Mus., vol. 7, 1877, p. 113.

*Uca stenodactyla* ORTMANN, Zool. Jahrb., Syst., vol. 10, 1897, p. 356 (part).

*Uca stenodactylus* RATHBUN, Proc. U. S. Nat. Mus., vol. 21, 1898, p. 603 (not synonymy).

*Type-locality.*—Pichilinque Bay, Gulf of California, U. S. Fisheries steamer *Albatross*, 1888; 1 male.

*Type.*—Cat. No. 22081, U.S.N.M.

*Distribution.*—From San Diego, California, to Mazatlan, Mexico; occasionally farther north. San Diego (Ortmann); San Bartolomé Bay, Lower California (Lockington); La Paz (Streets), specimens in United States National Museum; Guaymas Bay, William Palmer, collector; Mazatlan, C. H. Gilbert, collector; Seattle, Washington, D'Arcy W. Thompson, collector, photographs of large chela in United States National Museum; Vancouver Island, B. C., photographs received from C. F. Newcombe.

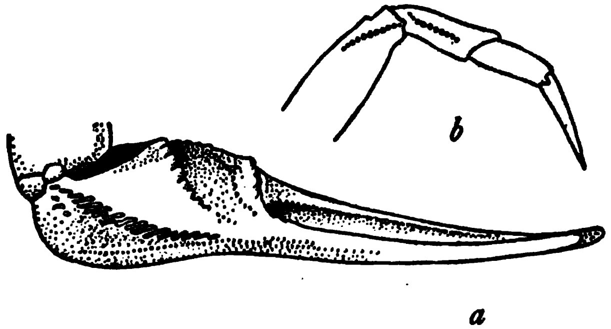

FIG. 5.—UCA MUSICA. *a.* LOWER VIEW OF LARGE (LEFT) CHELA OF MALE TYPE, SHOWING STRIDULATING RIDGE, × 3½. *b.* ANTERIOR (LOWER) VIEW OF PORTION OF FIRST LEFT AMBULATORY LEG OF MALE TYPE, SHOWING GRANULES WHICH PLAY AGAINST STRIDULATING RIDGE, × 3½.

*Dimensions.*—Type male; length of carapace 8 mm.; width 12.9 mm.

Very like *Uca stenodactylus* (Milne Edwards and Lucas),[1] which ranges from Salvador, Central America, to Valparaiso. Differs as

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[1] *Gelasimus stenodactylus* Milne Edwards and Lucas, Voy. dans l'Amér. Mérid. par d'Orbigny, vol. 6, 1844, Crust., p. 26; vol. 9 (atlas), 1847, pl. 11, fig. 2.

follows: The upper margin of the orbit is much less oblique. The lateral angle of the carapace, marking its greatest width, is farther back. The granules of the palm are of more uniform size. The palm is scarcely depressed near the immovable finger. The dactylus is more strongly arched. The transverse ridge across the inner surface of the palm is very prominent, is bent at an obtuse and rounded angle and is armed for nearly its whole length with a row of large tubercles. Near the proximal lower corner of the inner surface there is a longitudinally oblique stridulating ridge extending from the articulation with the carpus to the lower marginal line of the palm almost below the angle of the transverse ridge. The stridulating ridge is made up of closely placed parallel lines oblique to the axis of the ridge and subparallel to the lower margin of the palm. When the cheliped is flexed the ridge plays against a line of granules on the lower or anterior surface of the first ambulatory leg; this line extends nearly the whole length of the carpal segment and part way along the merus. The third to sixth abdominal segments of the male are more completely fused.

## EXPLANATION OF PLATES.

### Plate 1.

*Trizocarcinus dentatus*, male type, × 2.

Fig. 1. Antero-ventral view.
2. Dorsal view.
3. Posterior view.

### Plate 2.

*Cyrtoplax spinidentata*, male type, × 1½.

Fig. 1. Antero-ventral view.
2. Dorsal view.
3. Posterior view.

### Plate 3.

*Planes marinus*, male type, × 2.

Fig. 1. Antero-ventral view.
2. Dorsal view.
3. Ventral view.

### Plate 4.

*Cyrtograpsus altimanus*, × 2.

Fig. 1. Ventral view of male type.
2. Dorsal view of male type.
3. Antero-ventral view of male paratype.

### Plate 5.

*Platychirograpsus typicus*, dorsal view of male type, nat. size.

## PLATE 6.

*Sesarma* (*Sesarma*) *verleyi*, female type, × 1½.

FIG. 1. Ventral view.
2. Dorsal view.
3. Anterior view.

## PLATE 7.

*Sesarma* (*Sesarma*) *jarvisi*, male type, × 2

FIG. 1. Anterior view.
2. Dorsal view.
3. Ventral view.

## PLATE 8.

*Sesarma* (*Holometopus*) *tampicense*, male type, × 2.

FIG. 1. Anterior view.
2. Dorsal view.
3. Ventral view.

## PLATE 9.

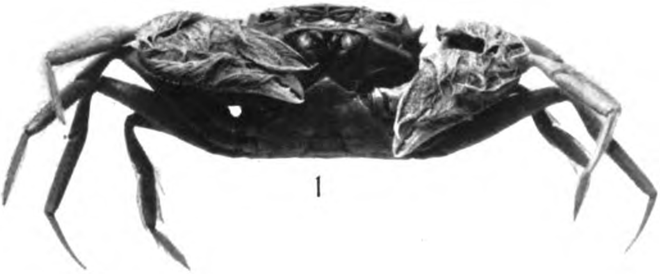
*Uca monilifera*, male type, nat. size.

FIG. 1. Anterior view.
2. Dorsal view.
3. Ventral view.

## PLATE 10.

*Uca musica*, male type, × 2.

FIG. 1. Antero-ventral view, showing outside of large chela.
2. Antero-dorsal view, showing top of large chela.
3. Dorsal view.
4. Postero-ventral view, showing under side of large chela with stridulating ridge.



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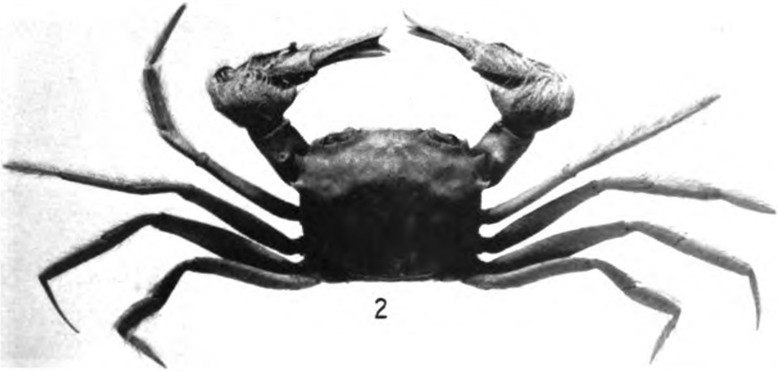

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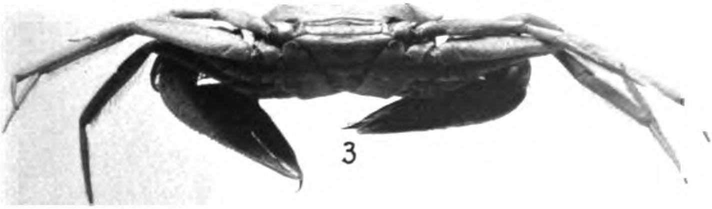

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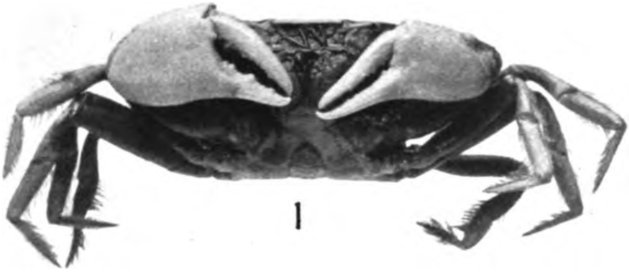
NEW AMERICAN BRACHYRHYNCHOUS CRABS.

FOR EXPLANATION OF PLATE SEE PAGE 128.



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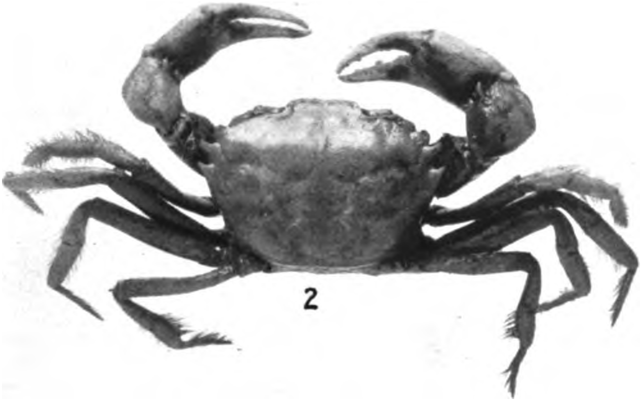

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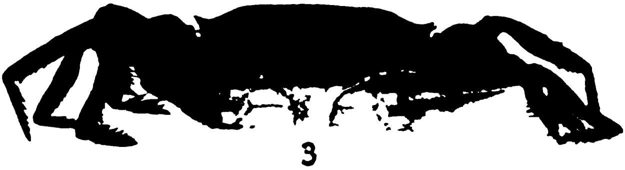

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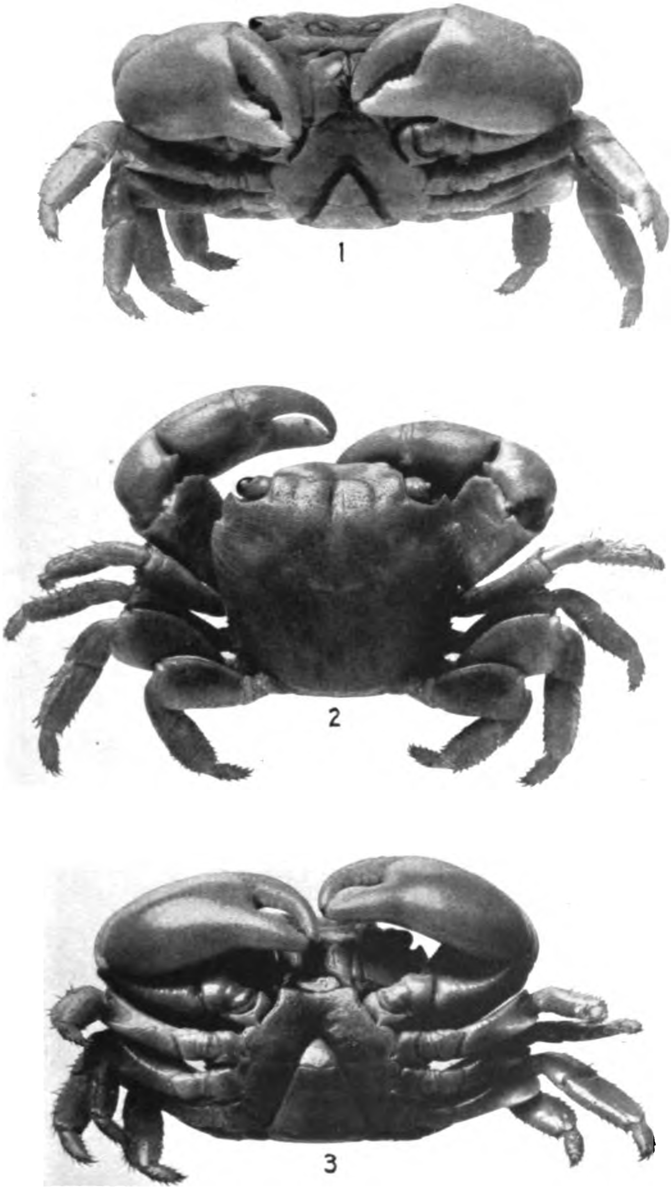
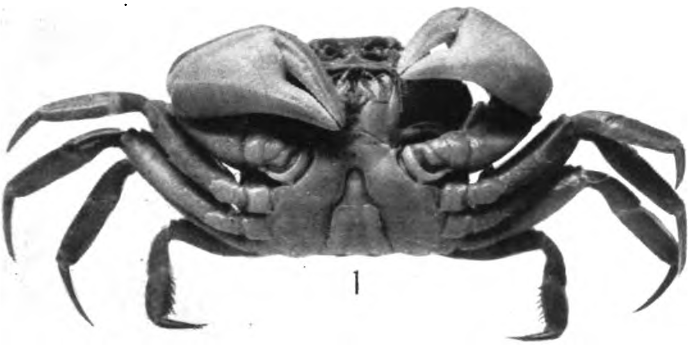
NEW AMERICAN BRACHYRHYNCHOUS CRABS.

FOR EXPLANATION OF PLATE SEE PAGE 128.



NEW AMERICAN BRACHYRHYNCHOUS CRABS.

FOR EXPLANATION OF PLATE SEE PAGE 128.



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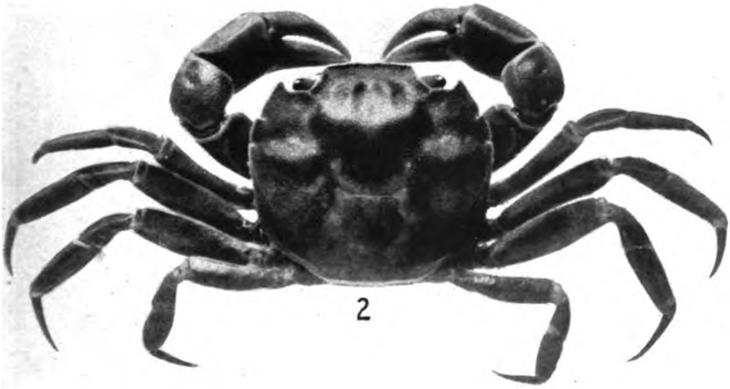

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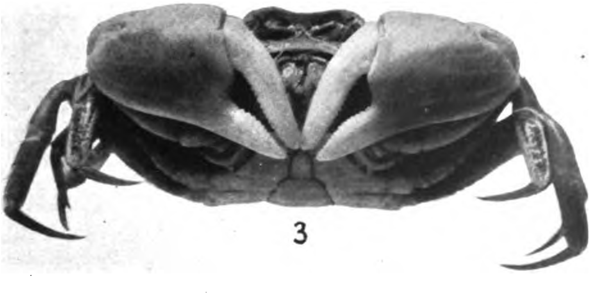

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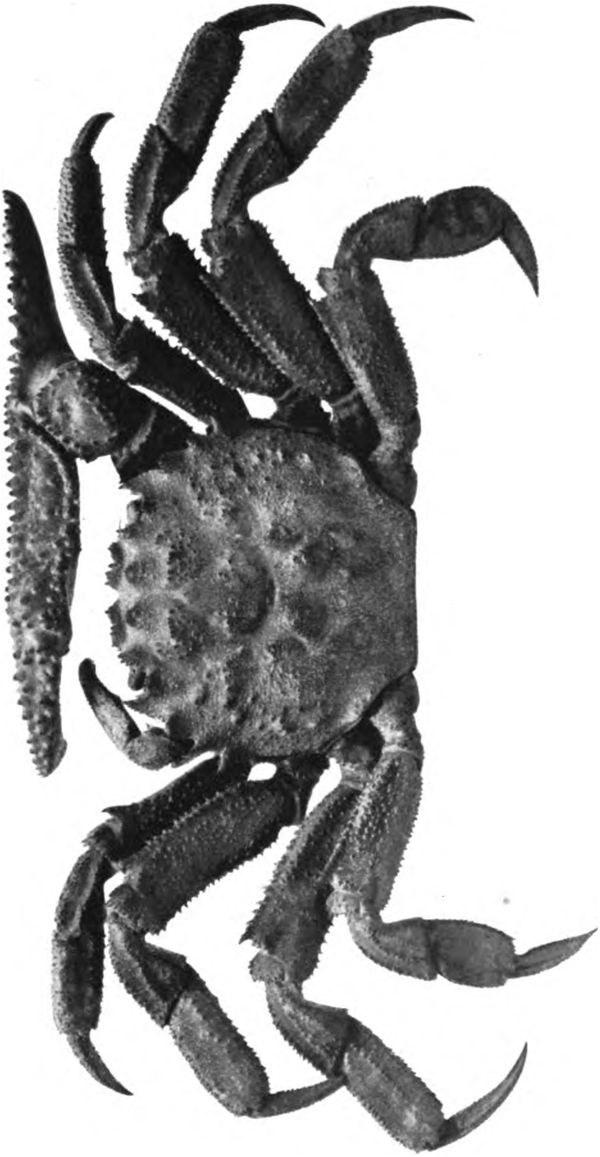
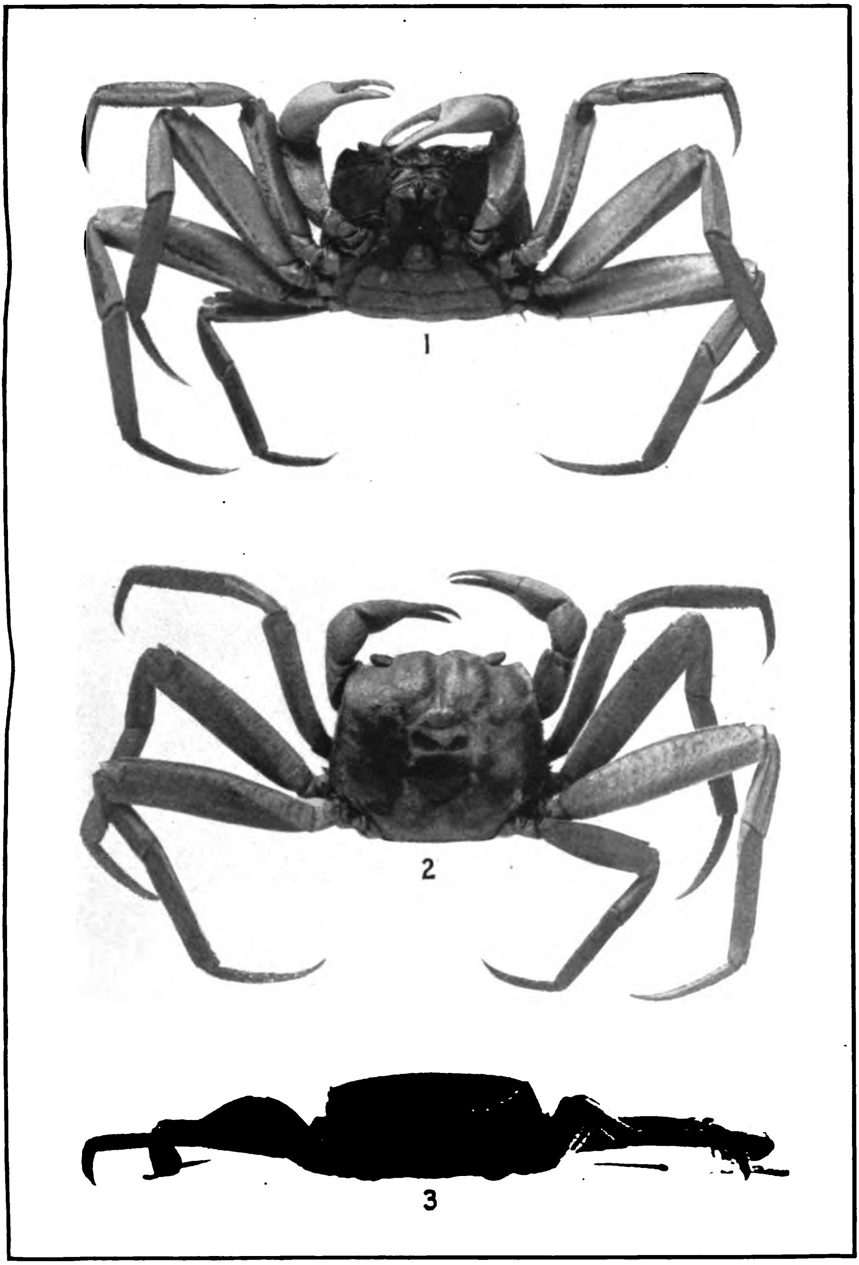
New American Brachyrhynchous Crabs.

For explanation of plate see page 128.



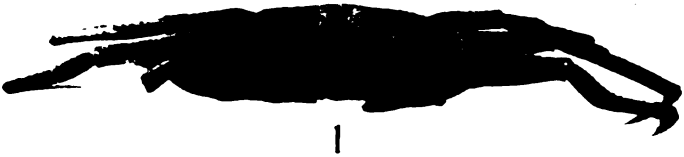
NEW AMERICAN BRACHYRHYNCHOUS CRABS.

FOR EXPLANATION OF PLATE SEE PAGE 128.



NEW AMERICAN BRACHYRHYNCHOUS CRABS.

FOR EXPLANATION OF PLATE SEE PAGE 129.



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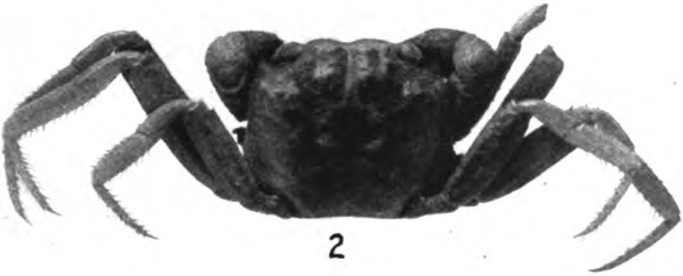

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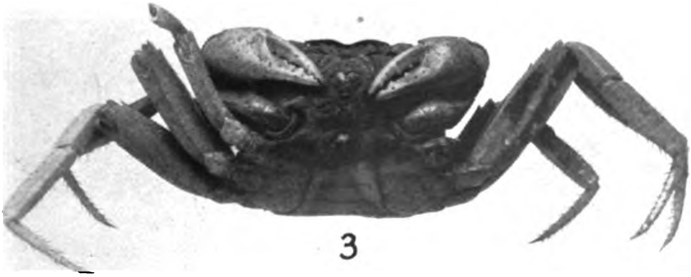
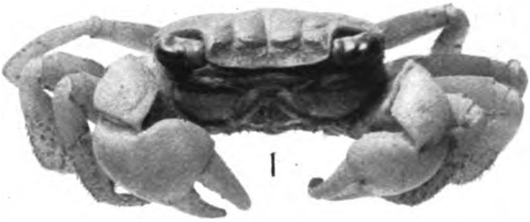


3

NEW AMERICAN BRACHYRHYNCHOUS CRABS.

FOR EXPLANATION OF PLATE SEE PAGE 129.



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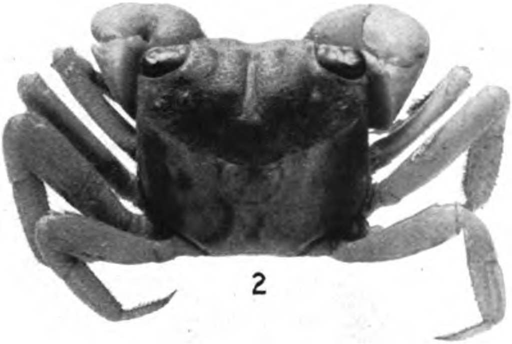

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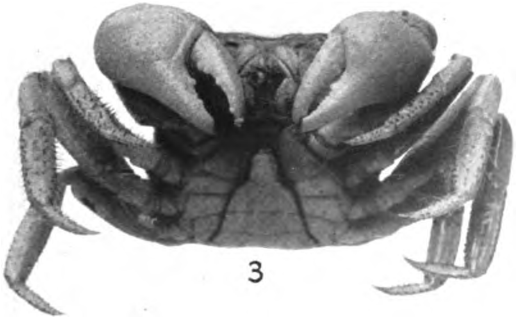
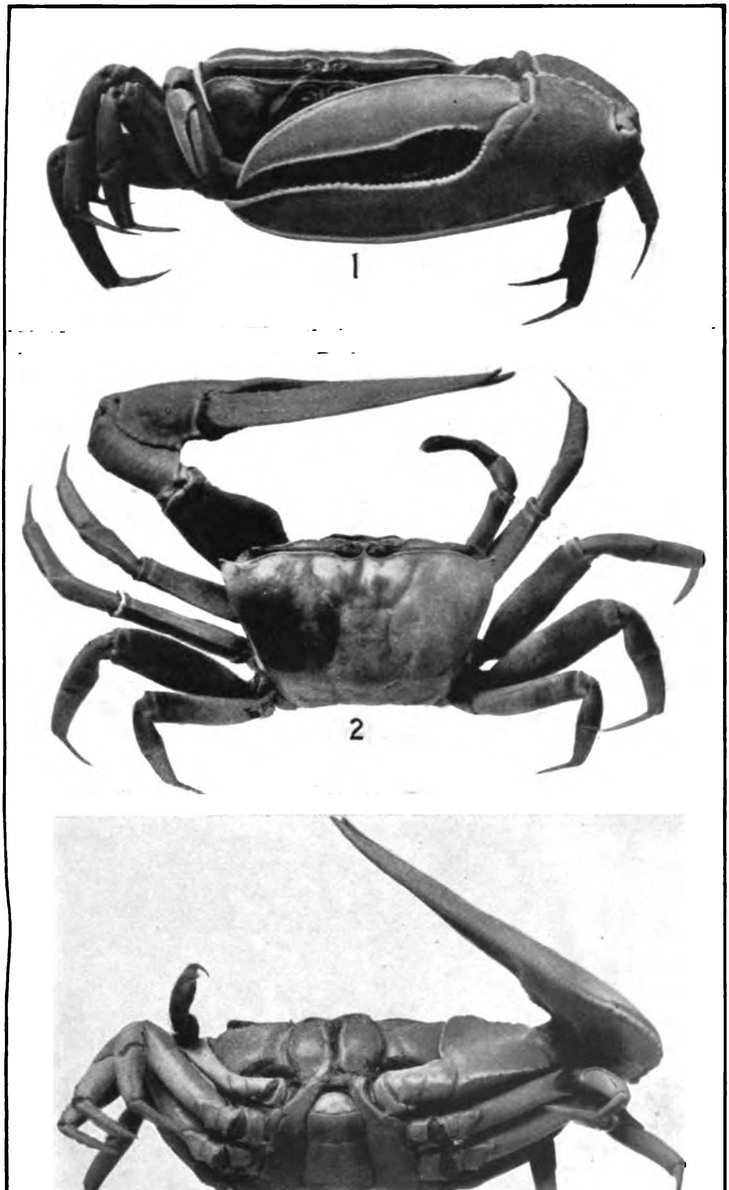


3

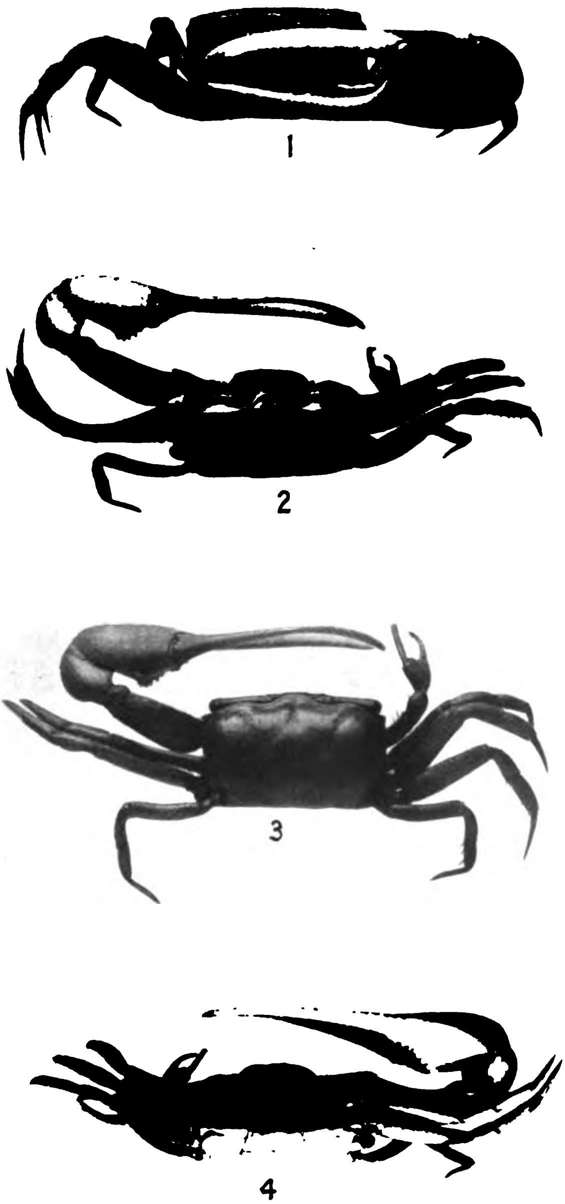
NEW AMERICAN BRACHYRHYNCHOUS CRABS.

FOR EXPLANATION OF PLATE SEE PAGE 129.



NEW AMERICAN BRACHYRHYNCHOUS CRABS.

FOR EXPLANATION OF PLATE SEE PAGE 129.



New American Brachyrhynchous Crabs.

For explanation of plate see page 129.

# HYMENOPTERA, SUPERFAMILIES APOIDEA AND CHALCIDOIDEA, OF THE YALE DOMINICAN EXPEDITION OF 1913.

By J. C. Crawford,

*Associate Curator, Division of Insects, United States National Museum.*

The material here listed came, unless otherwise stated, from the island of Dominica and was collected during June and July, 1913, by Mr. H. W. Foote. As almost nothing has been recorded in the Hymenoptera from this island, the collection is of especial interest.

## Superfamily APOIDEA.

### MELIPONA VARIEGATIPES Gribodo.

Eight workers of this form were taken.

### CENTRIS LANIPES Fabricius.

One female from Guadaloupe.

### CENTRIS VERSICOLOR Fabricius.

Six females and three males.

### ANTHOPHORA FOOTEI, new species.

*Male.*—Length about 10 mm. Similar to *A. krugii* but the clypeus above with two large dark spots, the pubescence of the face yellowish with black intermingled; the dorsum and upper half of pleuræ with fulvous pubescence, with a few black hairs intermingled; femora with white hairs; tibiæ exteriorly with fulvous pubescence; sixth abdominal segment with a broad ivory colored band; pubescence on last segment fulvous.

*Female.*—Length about 11 mm. Similar to the male but the face entirely dark, tibial scopa outwardly fulvous, inward black.

*Habitat.*—Island of Dominica.

Described from two males and one female.

*Type.*—Cat. No. 16731, U.S.N.M.

This species is named in honor of Mr. H. W. Foote.

### EXOMALOPSIS SIMILIS Cresson.

Eleven females.

### MELISSODES INSULARIS, new species.

*Male.*—Length about 9 mm. Black with the legs reddish-honey color; clypeus and labrum yellow, mandibles dark, with a medial reddish-testaceous band; antennæ as long as body, beneath reddish, except basal 3 joints; labrum covered with light yellowish hairs, clypeus and most of rest of face below antennæ with brown hair; above antennæ the hair ochraceous, on vertex brown; hair of thorax ochraceous, with a distinct reddish tinge at each side of anterior margin of mesoscutum; disk of mesoscutum and scutellum with black hair; wings slightly fumated; pubescence of legs reddish-ochraceous, on posterior tibiæ above, brown; abdomen brown, the apical margins of the segments reddish; first segment basally with ochraceous pubescence; second segment with a narrow basal band of appressed very light ochraceous pubescence; third segment with a similar broad discal band; fourth and fifth segments with similar narrower bands, just basad of the depressed apical margins of segments; rest of pubescence on dorsum of abdomen black; apical segment subtruncate and with a lateral tooth on each side near base.

*Habitat.*—Island of Dominica, West Indies.

Described from one specimen.

*Type.*—Cat. No. 16732, U.S.N.M.

*M. cajennensis* which has similarly colored legs has the mandibles yellow at base and no dark hairs on the dorsum of the mesonotum. The specimens recorded from the West Indies, as this species, are probably *M. rufodentata* Smith, which, however, may be a synonym of *cajennensis*.

### MELISSA IMPERIALIS Ashmead.

Three females and eight males.

### XYLOCOPA BRASILIANORUM Linnæus.

One female.

### MEGACHILE FLAVITARSATA Smith.

One male.

### MEGACHILE MULTIDENS Fox.

One female and one male. The latter smaller than the typical specimens and with the median pair of teeth on the apex of the abdomen longer and narrower. This species appears to be close to *M. concinna* Smith, which I have not seen. It differs in the female from the description of that species only in being smaller and having the ventral scopa on the penultimate segment black only at extreme sides.

### MEGACHILE ELONGATA Smith.

Two males which differ slightly in the last segment but otherwise agree perfectly. They are, in this one character, slightly different from another male in the collection of the United States National

Museum from Santo Domingo. As all three agree except for the slight difference of this one character, it would appear that in this species the amount of indentation of the last dorsal segment and the exact formation of the two teeth formed thereby is not constant. All three specimens are smaller than the measurements given by Smith, being only 10–12 mm.

### MEGACHILE BINOTATA Guerin.

Two females.

### COELIOXYS ABDOMINALIS Guerin.

Two females and one male.

### HALICTUS, species.

One male which could not be specifically named.

### HALICTUS PUNCTIFRONS, new species.

*Female.*—Length about 6 mm. Head and thorax dark dull green, with sparse brown hairs; abdomen brown; facial quadrangle longer than broad, the clypeus produced, apically brown; supraclypeal area elongate running up to insertion of antennæ; head and thorax with exceedingly fine crowded punctures; dorsum of propodeum covered with shallow irregular thimble-like sculpture, at extreme sides with three or four weak rugulæ; tegulæ dark brown; stigma and veins very dark brown; legs brown, tarsi more reddish, hind inner spurs with about four long teeth; scopa on femora light yellow, on tibiæ darker, on outer faces of tibiæ more brown; abdomen strongly transversely lineolate.

*Habitat.*—Island of Dominica.

*Type.*—Cat. No. 16733, U.S.N.M.

This species resembles *H. auratus* Ashmead, which has a similarly shaped head, but that species has the head and thorax green and the dorsum of propodeum rugulose all over, etc.

### AUGOCHLORA IGNIFERA, new species.

*Female.*—Length 7–8 mm.. Brilliant fiery red; clypeus at sides and the anterior margin narrowly greenish; mandibles at base with a green spot; clypeus elevated and produced; clypeus and supraclypeal area smooth, with large, sparse punctures; sides of face closely punctured, above insertion of antennæ the punctures becoming finer and crowded; antennæ beneath obscurely reddish; rear of head with a carina separating post-vertex from posterior plane of head; mesoscutum with punctures about as on vertex but anteriorly toward sides the sculpture somewhat more rugose; scutellum with the puncture finer and not crowded, metanotum with only a few setigerous punctures toward apex; propodeum with the dorsal face separated from the sides and posterior face by being angulated; the dorsal face with sparse somewhat diverging rugulæ; tegulæ brown; wings somewhat infuscated; second submarginal cell slightly more than half as long as third, as long as the first transverse cubital vein; third submarginal narrowed about one-half toward marginal; marginal cell minutely truncate at apex; legs dark brown, the coxæ concolorous with the body; tarsi apically more reddish; scopa on femora very light ochraceous, on tibiæ and tarsi more yellow, hind inner spur minutely denticulate; abdomen almost impunctate except for insertions of hair, which are coarser on the first segment; apical margins of segments very narrowly black; base of first segment with long yellow pubescence, rest of abdomen with very thin dark pubescence; venter dark brown; tooth on first ventral segment very poorly developed and more like a strongly elevated carina.

*Male.*—Length about 7 mm. Similar to the female but with more coppery and greenish reflections; punctures of the mesoscutum and scutellum not so close as in female and somewhat coarser; metanotum covered with fine punctures; tegulæ and legs aeneous, the legs basad becoming more greenish; venter green basally and coppery apically, with broad apical margins of segments brown, the first segment medially carinate on apical half.

*Habitat.*—Island of Dominica.

Described from 13 females and 4 males.

*Type.*—Cat. No. 16734, U.S.N.M.

In Vachal's table[1] runs to couplet 35 but does not agree with either alternate.

## Superfamily CHALCIDOIDEA.

### SPILOCHALCIS FEMORATUS Fabricius.

One female and five males.

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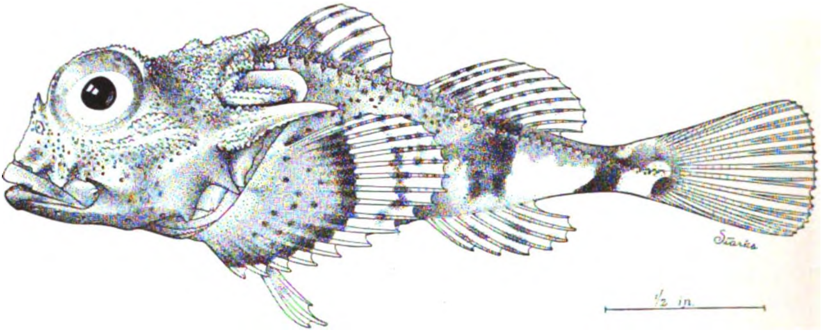
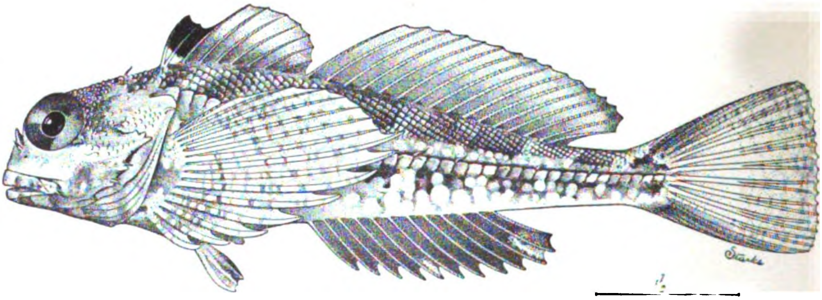
[1] Misc. Ent., vol. 19, 1911, pp. 14 and following.



1. ENOPHRYS TAURINUS, NEW SPECIES.



2. ORTHONOPIAS TRIACIS STARKS AND MANN.

COTTOID FISHES FROM MONTEREY BAY, CALIFORNIA.

FOR EXPLANATION OF PLATE SEE PAGES 135 AND 136.

# TWO COTTOID FISHES FROM MONTEREY BAY, CALIFORNIA.

By Charles H. Gilbert,

*Of Stanford University, California.*

The two Cottoid fishes here noted are new to Monterey Bay and one of them represents an undescribed species. The material was collected and donated by Mr. Frederick Woodworth, and was taken with a small boat dredge in shallow water near the shore.

### ENOPHRYS TAURINUS, new species.

Plate 11, fig. 1.

*Type.*—A specimen 64 mm. long, dredged in shallow water in Monterey Bay, near Pacific Grove, California. Cat. No. 75064, U.S.N.M.

Measurements in hundredths of length without caudal fin: Length of head, 48; greatest depth of body, 31; least depth of caudal peduncle, 6.5; length of snout, 12.5; diameter of eye, 14; interorbital width, 7; length of maxillary, 17.5; length of preopercular spine, 21; length of occipito-nuchal ridge, 18; length of opercular ridge, 11; length of pectoral fin, 30; length of ventral fin, 19.

Most closely related to *E. claviger*, with which it agrees in the high compressed snout and the small mouth, in the presence of a band of fine prickles above the lateral line, and in the absence of the lengthwise median plate between the nuchal ridges, which is present in *E. bison*. It differs from *E. claviger* in the shorter, more robust preopercular spine, and from both *claviger* and *bison* in the reduced number of rays in the dorsal and anal fins. Ten specimens of *E. bison* from Puget Sound have the fin rays as follows:

| | Dorsal spines. | | Dorsal rays. | | Anal rays. | |
|---|---|---|---|---|---|---|
| | VIII | IX | 11 | 12 | 8 | 9 |
| Specimens | 8 | 2 | 6 | 4 | 3 | 7 |

Proceedings U. S. National Museum, Vol. 47—No. 2049.

In *E. claviger*, the fin rays are still more numerous, 5 specimens from Bering Sea examined by us having the dorsal VIII–14, and the anal with 11 or 12 rays. In both type and cotype of *E. taurinus*, the dorsal rays are VII–9, the anal rays 7.

The orbital region is compressed and high, strongly arched above the occipital and the nasal regions. Interorbital space concave, the occipital region more deeply so. Anterior profile nearly vertical. Mouth small, the maxillary reaching vertical from front of pupil. Eye large, its diameter about twice the interorbital width, equaling the length of the snout. Nasal spines strong in the type, the nasal bones sculptured. Preorbital with two strongly protruding spinous processes in the young type, these little marked in the adult cotype. Upper preopercular spine robust, reaching well beyond the opercular margin; the usual three strong spines below it. Opercular ridge very high, rough-granular. All exposed bones of head finely granular. A single short filament at tip of maxillary, the cotype with a papilla or undeveloped filament anteriorly at its base. Teeth fine, in broad bands in the jaws, a narrow band on the vomer, the palatines naked. A short slit behind the fourth gill-arch. Isthmus very wide, equaling the distance separating the two pectoral fins.

Plates of the lateral line higher than long, those anteriorly with a sharp lengthwise crest, which becomes rounded in the posterior scutes. The lateral line opens principally in a single minute pore above each plate and a similar one below it, but occasionally more than one such pore is present, especially in the anterior part of body. The space between the lateral line and the base of the dorsal is covered with fine prickles, more evident in the young than in adults. The anus is but little in advance of the first anal ray, not reached by the tips of the ventral fins.

Upper parts olive or olive-brown, marbled or mottled with lighter, and with scattered small blackish brown spots. Under parts light, a white streak below middle of sides sending irregular incursions into the darker area above, this more noticeable in the adult specimen. A double dark bar below the soft dorsal, one encircling caudal peduncle below, a dark blotch at base of lower caudal rays. Pectoral with a dusky basal area which intensifies posteriorly to form a brown bar on middle of fin; beyond that a broad white bar, the terminal area of fin with a second narrow brown bar or with small brown spots. In the cotype, the entire lower side of head is dusky.

In addition to the type, a specimen 160 mm. long, here designated a cotype, is in the collection of Stanford University, from *Albatross* station 2893, in the Santa Barbara Channel, southern California, depth 145 fathoms. The dorsal spines of this specimen have been injured, but can be counted without possibility of error, and the other fins are intact.

### ORTHONOPIAS TRIACIS Starks and Mann.

Plate 11, fig. 2.

*Orthonopias triacis* STARKS and MANN, Univ. of Cal. Pub. Zool., vol. 8, 1911, p. 11, fig. 1.

This species has been known heretofore only from the type-specimen, taken in shallow water on Cortez Banks, near San Diego. A second specimen is here recorded from Monterey Bay, where it was taken by a dredge at a depth of a few fathoms only.

D. IX–16; A. 12; P. 15; V. I, 3.

Lateral line with a series of 38 scales, the upper and the posterior margins of which are wholly free and are throughout very finely toothed. In *Astrolytes,* only a part of the posterior margin is exposed and this is faintly or not at all toothed. In *Axyrias,* both margins are exposed and are serrulate, though less so than in *Orthonopias. Axyrias* and *Astrolytes* are not very well separated, for while *Axyrias* has typically a simply furcate preopercular spine, occasional examples develop a third tooth, as is always the case in *Astrolytes.* If this character is disregarded, there is nothing essential to distinguish the two genera. *Orthonopias* is also very closely related, but may claim a certain distinction in the location of the anus, which is placed well forward near the base of the ventral fins, while in the other two genera mentioned it is almost immediately in advance of the first anal ray.

The longest oblique series of scales in the dorso-lateral band contains 14 scales, while several others contain 13. A very narrow naked strip intervenes between this band and the base of the second dorsal, and even this is partly filled with small spinous scales lying at the base of the dorsal rays, one or two to each ray.

The cirri are somewhat differently disposed than in the type. The four forming a line on top of head behind each eye are present, but the one behind eye is lacking. There is one on each nasal spine, and one or two on each of the three lower preopercular spines. The two on tip of maxillary are as described, and two are present closely apposed on posterior opercular angle. There is one on shoulder, behind the opercular angle, and several others scattered along the length of the lateral line.

This species was set aside as new prior to its publication by Starks and Mann, and the figure then prepared is here reproduced. The first two dorsal spines are here represented as much shorter than those which follow. As this was apparently not true of the type, it may in this specimen be due to injury, although the fin has not that appearance.

# REPORT ON THE LEPIDOPTERA OF THE SMITHSONIAN BIOLOGICAL SURVEY OF THE PANAMA CANAL ZONE.

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By HARRISON G. DYAR,

*Custodian of Lepidoptera, United States National Museum.*

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The present paper deals with the so-called Macrolepidoptera collected in Panama under the auspices of the Smithsonian Biological Survey, in the Canal Zone and from localities outside of it.

Most of the specimens here treated were collected by Mr. August Busck, who went primarily to collect "Micros" and took the "Macros" only as a side issue. Consequently the larger "Macros," especially the Papilionoidea and the larger moths will be found poorly representsd in this list. The little "Macros," especially the small Noctuidæ, Lithosiidæ, and Pyralidæ, will be found unusually well represented, many hitherto undiscovered species being among them.

There are reported on here 8,254 specimens in 1,713 species. Some additional material, which proved impracticable to incorporate, will raise the total number of specimens in the collection to about 9,000, but will not increase the number of species greatly.

## Superfamily PAPILIONOIDEA.

### Family PAPILIONIDÆ.

**PALILIO THOAS NEACLES Rothschild and Jordan.**

2. [1] Cabima,[2] May, 1911 (Busck); Ancon, Canal Zone (O. Celestine).

**PAPILIO ERITHALION Boisduval.**

9. Porto Bello, March, 1911 (Busck); Trinidad River, May, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**PAPILIO POLYDAMAS Linnæus.**

1. Ancon, Canal Zone (O. Celestine).

**PAPILIO XANTICLES Bates.**

1. La Chorrera, May, 1912 (Busck).

**PAPILIO ILUS Fabricius.**

1. Cabima, May, 1911 (Busck).

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[1] The number preceding the localities indicates the number of specimens of the species before me.

[2] The locality Panama is to be understood in each instance.

## Family PIERIDÆ.

**PIERIS MARGARITA Hübner.**

1. Trinidad River, June, 1912 (Busck).

**PIERIS MONUSTE Linnæus.**

2. Panama City, January, 1913 (B. G. Ireneo.)

**PIERIS PANDROSIA Hewitson.**

9. Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Paraiso, Canal Zone, April, 1911 (Busck).

**PIERIS KICAHA Reakirt.**

1. Alhajuelo, April, 1911 (Busck).

**PIERIS JOSEPHA Godman and Salvin.**

2. Alhajuelo, April, 1911 (Busck).

**PIERIS MELENEKA Hewitson.**

3. Paraiso, Canal Zone, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

The three specimens are females and all differently marked.

**CALLIDRYAS EUBULE Linnæus.**

5. Ancon, Canal Zone (O. Celestine); La Chorrera, April, 1912 (Busck); Panama City, May, 1912 (B. G. Ireneo).

**CALLIDRYAS PHILEA Linnæus.**

2. La Chorrera, May, 1912 (Busck).

**PHOEBIS ARGANTE Fabricius.**

7. Taboga Island, February, 1912 (Busck); La Chorrera, May, 1912 (Busck); Paraiso, Canal Zone, June, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**PHOEBIS AGARITHE Boisduval.**

1. La Chorrera, May, 1912 (Busck).

**APHRISSA STATIRA Cramer.**

5. Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**RHABDODRYAS TRITE Linnæus.**

1. Trinidad River, June, 1912 (Busck).

**DISMORPHIA DISCREPANS Butler.**

2. Trinidad River, March, 1911 (Busck).

**TERIAS NEDA Godart.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

**TERIAS TENELLA Boisduval.**

2. Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**TERIAS ALBULA Cramer.**

7. Porto Bello, March, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**TERIAS CEPIO Butler.**

15. Taboga Island, February, 1912 (Busck); Paraiso, Canal Zone, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck).

**TERIAS ELATHEA** Cramer.

1. Ancon, Canal Zone (O. Celestine).

**TERIAS PERSISTENS** Butler.

1. La Chorrera, May, 1912 (Busck).

## Family NYMPHALIDÆ.

### Subfamily NYMPHALINÆ.

**METAMORPHA DIDO** Linnæus.

1. Trinidad River, May, 1911 (Busck).

**COLAENIS JULIA** Fabricius.

10. Porto Bello, February, 1911, April, 1912 (Busck); Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**COLAENIS PHÆRUSA** Linnæus.

10. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1911 (Busck); Trinidad River, May, 1911 (Busck); Ancon, Canal Zone (O. Celestine).

**AGRAULIS VANILLÆ** Linnæus.

1. Ancon, Canal Zone (O. Celestine).

**EUPTOIETA HEGESIA** Cramer.

2. Ancon, Canal Zone (O. Celestine); Panama City, June, 1912 (B. G. Ireneo).

**SYNCHLOË LACINIA** Geyer.

2. Ancon, Canal Zone (O. Celestine); Penonome, Province of Cocle, February, 1913 (B. G. Ireneo).

**SYNCHLOË HYPERIA** Fabricius.

6. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**ERESIA CLARA** Bates.

3. Paraiso, Canal Zone, February, 1911 (Busck).

**ERESIA OFELLA** Hewitson.

1. Alhajuelo, April, 1911 (Busck).

**ERESIA DRYPATIS** Godman and Salvin.

2. Trinidad River, March and June, 1912 (Busck).

**PHYCIODES LEUCODESMA** Felder.

8. Paraiso, Canal Zone, January, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Ancon, Canal Zone (O. Celestine).

**PHYCIODES FRAGILIS** Bates.

4. Paraiso, Canal Zone, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

**PHYCIODES PTOLYCA** Bates.

4. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island. February, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**PHYCIODES TULCIS** Bates.

6. Paraiso, Canal Zone, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Trinidad River, May, 1911 (Busck); Panama City, February, 1913 (B. G. Ireneo).

**JUNONIA CŒNIA** Hübner.

1. Alhajuelo, April, 1911 (Busck).

**ANARTIA JATROPHÆ** Linnæus.

9. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, April, 1912 (Busck); Panama City, September, 1912 (B. G. Ireneo).

**ANARTIA FATIMA** Fabricius.

11. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, April, 1912 (Busck); Ancon, Canal Zone (O. Celestine); Panama City, September, 1912 (B. G. Ireneo); Trinidad River, March, 1912 (Busck).

**EUNICA MODESTA** Bates.

1. Porto Bello, April, 1911 (Busck).

**NICA CANTHARA** Doubleday.

5. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, June, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**EPICALIA NYCTIMUS** Westwood.

2. Cabima, May, 1911 (Busck).

**EUBAGIS SALPENSA** Felder.

2. Porto Bello, February, 1911 (Busck).

**EUBAGIS POSTVERTA** Cramer.

4. Taboga Island, February, 1912 (Busck).

**EUBAGIS PIERIDOIDES** Felder.

2. Taboga Island, February, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**GYNÆCIA DIRCE** Linnæus.

2. Panama City, September, 1912 (B. G. Ireneo); Trinidad River, March, 1912 (Busck).

**CALLIZONA ACESTE** Linnæus.

1. Trinidad River, March, 1912 (Busck).

**PERIDROMIA FERONIA** Linnæus.

2. Paraiso, Canal Zone, June, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**PERIDROMIA FERENTINA** Godart.

2. La Chorrera, May, 1912 (Busck); Ancon, Canal Zone (O. Celestine).

**TIMESTES CHIRON** Fabricius.

1. Alhajuelo, May, 1911 (Busck).

**PYRRHOGYRA CRAMERI** Aurivillius.

1. Trinidad River, June, 1912 (Busck).

**ADELPHA URRACA** Felder.

1. Porto Bello, April, 1912 (Busck).

**ADELPHA CYTHEREA** Linnæus.

4. Porto Bello, February, 1911 (Busck); Trinidad River, March and June, 1912 (Busck).

**ADELPHA IPHICLA** Linnæus.

1. Taboga Island, February, 1912 (Busck).

### Subfamily SATYRINÆ.

**PIERELLA LUNA** Fabricius.

1. Porto Bello, March, 1911 (Busck).

**ANTIRRHEA MILTIADES** Fabricius.

1. Taboga Island, February, 1912 (Busck).

**EUPTYCHIA OCIRRHOE** Fabricius.

2. Porto Bello, February, 1911, April, 1912 (Busck).

**EUPTYCHIA MOLLINA** Hübner.

5. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, March, 1911, April, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**EUPTYCHIA CONFUSA** Staudinger.

1. Paraiso, Canal Zone, February, 1911 (Busck).

**EUPTYCHIA EBUSA** Cramer.

1. Paraiso, Canal Zone, January, 1911 (Busck).

**EUPTYCHIA LIBYE** Linnæus.

4. Paraiso, Canal Zone, January, 1911 (Busck); Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**EUPTYCHIA MARISEA**, new species.

Dark brown; fore wing with a black spot centrally above vein 1 surrounding a longitudinal tuft of hair; no markings. Beneath light lilacine gray; both wings with two broad straight central rusty brown bands as in *libye* Linnæus; a double narrow marginal line and broad wavy submarginal one. Fore wing with a small subapical ocellus, followed below by a brown band. Hind wing with five ocelli, second and fifth from apex large. Expanse, 31 mm.

*Type.*—Male No. 15752, U.S.N.M.; Alhajuelo, April, 1911 (Busck).

**EUPTYCHIA PHARES** Godart.

5. Taboga Island, February, 1912 (Busck); Cabima,, May, 1911 (Busck).

**EUPTYCHIA CAMERTA** Cramer.

20. Paraiso, Canal Zone, January, 1911 (Busck); Taboga Island, February, 1912 (Busck); Porto Bello, March, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**TAYGETIS KERRA** Butler.

1. Alhajuelo, April, 1911 (Busck).

**TAYGETIS ANDROMETA** Cramer.

8. Taboga Island, January, 1911, February, 1912 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

### Subfamily BRASSOLINÆ.

**ERYPHANIS AUTOMEDON** Cramer.

1. Taboga Island, February, 1912 (Busck).

**CALIGO EURYLOCHUS** Cramer.

1. Porto Bello, February, 1911 (Busck).

**CALIGO OILEUS HYPOSCHESIS**, new subspecies.

Differs from *oileus* Felder in the basal two-thirds of fore wing being washed with pale ocherous. Spots at apices of fore wing nearly obsolete. Hind wing strongly touched with white on margin. Expanse, 97 mm.

*Cotypes.*—Two males, No. 15753, U.S.N.M.; Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, May, 1911 (Busck).

The specimens are small. The variety *scamander* Boisduval has an ocherous band beyond cell, but in this the color is evenly diffused nearly to base.

**BRASSOLIS ISTHMIA** Bates.

4. Taboga Island, February, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); also pupæ, Ancon, Canal Zone (H. F. Schultz); adults, larva and pupa from cocoanut trees, Panama City, April, 1913 (B. G. Ireneo).

**OPSIPHANES INVIRÆ** Hübner.

1. Paraiso, Canal Zone, January, 1911 (Busck).

**OPSIPHANES CASSIÆ** Linnaeus.

1. Ancon, Canal Zone (O. Celestine).

### Subfamily MORPHINÆ.

**MORPHO PELEIDES** Kollar.

15. Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**MORPHO AMATHONTE** Deyrolle.

2. Porto Bello, February, 1911 (Busck): Alhajuelo, April, 1911, (Busck).

### Subfamily DANAINÆ.

**DANAIS PLEXIPPUS** Linnaeus.

1. Ancon, Canal Zone (O. Celestine).

**DANAIS GILIPPUS** Cramer.

1. Ancon, Canal Zone (O. Celestine).

**DANAIS BERENICE** Cramer.

1. Paraiso, Canal Zone, June, 1911 (Busck).

**LYCOREA CLEOBÆA** Godart.

1. Chiriqui, September, 1912 (B. G. Ireneo).

**TITHOREA HIPPOTHOUS** Godman and Salvin.

1. Porto Bello, February, 1912 (Busck).

**MELINÆA IDÆ** Felder.

5. Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); Trinidad River, May, 1911, June, 1912 (Busck); Ancon, Canal Zone (B. G. Ireneo).

**AERIA AGNA** Godman and Salvin.

4. Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck); Paraiso, Canal Zone, January, 1911 (Busck).

**MECHANITIS MACRINUS** Hewitson.

2. Porto Bello, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

**MECHANITIS ISTHMIA** Bates.

9. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); Ancon, Canal Zone (O. Celestine); Panama City (B. G. Ireneo).

**SCADA XANTHINA** Bates.

1. Trinidad River, June, 1912 (Busck).

**CERATINIA MEGALOPOLIS** Felder.

1. Porto Bello, February, 1911 (Busck).

**CERATINIA LEUCANIA** Bates.

3. Trinidad River, June, 1912 (Busck); Panama City (B. G. Ireneo).

**CERATINIA CLEIS** Bates.

3. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, February, 1911 (Busck); Ancon, Canal Zone (B. G. Ireneo).

**DIRCENNA EUCHYTMA** Felder.

2. Paraiso, Canal Zone, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

**EPITHOMIA CALLIPERO** Bates.

6. Trinidad River, March, 1912, May, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

**CALLOLERIA TUTIA** Hewitson.

2. Paraiso, Canal Zone, January, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**LEUCOTHYRIS PAULA** Weymer.

2. Porto Bello, March, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**HYPOLERIA LIBERA** Godman and Salvin.

1. Cabima, May, 1911 (Busck).

### Subfamily HELICONINÆ.

**HELICONIUS JUCUNDUS** Bates.

6. Cabima, May, 1911 (Busck); Porto Bello, May, 1911( Busck); Trinidad River, March, 1912, May, 1911, June, 1912 (Busck).

**HELICONIUS ALBUCILLA** Bates.

4. Trinidad River, March, 1912 (Busck); Porto Bello, March, 1911 (Busck); Cabima, May, 1911 (Busck).

**HELICONIUS ISMENIUS** Latreille.

1. Porto Bello, February, 1911 (Busck).

**HELICONIUS CHARITHONIA Linnæus.**

2. La Chorrera, May, 1912 (Busck); Ancon, Canal Zone (O. Celestine).

**HELICONIUS CLAUDIA Godman and Salvin.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

**HELICONIUS PETIVERANUS Doubleday.**

42. Porto Bello, March, 1911 (Busck); Cabima, May, 1911 (Busck); Arajan, May, 1911 (Busck); Taboga Island, June, 1911 (Busck); Paraiso, Canal Zone, June, 1911 (Busck); Trinidad River, June, 1912 (Busck); Panama City (B. G. Ireneo).

**HELICONIUS MELPOMENE Linnæus.**

16. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); Paraiso, Canal Zone, June, 1911 (Busck); Taboga Island, June, 1911 (Busck); Panama City (B. G. Ireneo).

**HELICONIUS CHIONEUS Bates.**

1. Cabima, May, 1911 (Busck)

**HELICONIUS ZULEIKA Hewitson.**

1. Trinidad River, March, 1912 (Busck).

**HELICONIUS MAGDALENA Bates.**

11. Trinidad River, March, 1912, May, 1911, and June, 1912 (Busck); Cabima, May, 1911 (Busck).

**HELICONIUS ERATO Linnæus.**

2. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**EUEIDES ZORCAON Reakirt.**

5. Paraiso, Canal Zone, May, 1911 (Busck).

**EUEIDES ALIPHERA Godart.**

1. Alhajuelo, April, 1911 (Busck).

## Family RIODINIDÆ.

**EURYBIA LYCISCA Doubleday and Hewitson.**

1. Porto Bello, April, 1912 (Busck).

**EURYBIA UNXIA Godman and Salvin.**

4. Porto Bello, February, 1911 (Busck); Paraiso, Canal Zone, February, 1911 (Busck).

**EURYBIA HALIMEDE Hubner.**

2. Alhajuelo, April, 1911 (Busck).

**DIORHINA PERIANDER Cramer.**

1. Trinidad River, March, 1912 (Busck).

**ERYCINA INCA Staudinger.**

1. Trinidad River, March, 1912 (Busck).

**MESOSEMIA TELEGONE Boisduval.**

9. Taboga Island, February and June, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**MESOSEMIA MOLINA** Godman and Salvin.

3. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

**MESOSEMIA ASA** Hewitson.

2. Porto Bello, February, 1911 (Busck).

**CHIMASTRUM ARGENTEUM** Bates.

1. Taboga Island, February, 1912 (Busck).

## OTACUSTESIS, new genus.

Venation essentially as in *Cartea* Kirby,[1] but vein 5 arising from upper fourth of cross vein and 10 arising shortly beyond end of cell instead of from the same point as 6, 6 therefore well beyond 10. Palpi short, not visible from above.

*Type of the genus—Otacustesis pericopidis*, new species.

**OTACUSTESIS PERICOPIDIS**, new species.

Fore wing black; a row of four white-hyaline elongate spots across the apex between veins 3 to 7; a subhyaline streak in lower half of cell. one above vein 2 and two in submedian interspace, all faintly washed with violaceous. Hind wing reddish orange with black border, strongly indented on the veins. Body black; orbits, collar, palpi, and anal tuft orange; abdomen washed with whitish on the sides and venter.

*Type.*—No. 15754, U.S.N.M., Paraiso, Canal Zone, February, 1911 (Busck).

**MESENE RUBELLA** Bates.

1. Paraiso, Canal Zone, February, 1911 (Busck).

**BAEOTIS ZONATA** Felder.

1. Taboga Island, February, 1911 (Busck).

**PEROPHTHALMA TENERA** Westwood.

3. Paraiso, Canal Zone, January, 1911 (Busck).

**CHARIS AVIUS** Cramer.

2. Porto Bello, February and March, 1911 (Busck).

**CHARIS HERMODORA** Felder.

14. Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); Porto Bello, April, 1911 (Busck); Taboga Island, June, 1911 (Busck); Paraiso, Canal Zone, June, 1911 (Busck).

**CHARIS GYNAEA** Godart.

5. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, March, 1912 (Busck); Taboga Island, June, 1911 (Busck).

**SAROTA CHRYSUS** Cramer.

3. Porto Bello, February, 1911 (Busck); Paraiso, Canal Zone, February, 1911 (Busck).

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[1] See Stichel, Gen. Ins., Lep. Rhop., Riodinidæ, 1910, pl. 10, fig. 39, p. 157.

**ANTEROS FORMOSUS** Cramer.

1. Porto Bello, April, 1912 (Busck).

**EMESIS FASTIDIOSA** Ménétriés.

2. Taboga Island, February, 1912, and June, 1911 (Busck).

**METACHARIS VICTRIX** Hewitson.

5. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**LEMONIAS LEUCIANUS** Hübner.

14. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck).

**LEMONIAS CILISSA** Hewitson.

1. Cabima, May, 1911 (Busck).

**LEMONIAS PELARGE** Godman.

1. Taboga Island, February, 1912 (Busck).

**THISBE IRENAEA** Cramer.

1. Taboga Island, February, 1912 (Busck).

**NYMPHIDIUM ADELPHINUM** Godman and Salvin.

1. Chiriqui, September, 1912 (B. G. Ireneo).

**NYMPHIDIUM MANTUS** Cramer.

2. Trinidad River, March and April, 1912 (Busck).

**NYMPHIDIUM LAMIS** Cramer.

1. Alhajuelo, April, 1911 (Busck).

**NYMPHIDIUM ASCOLIA** Hewitson.

2. Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**NYMPHIDIUM MOLPE** Hübner.

2. Taboga Island, February, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**ARICORIS JANSONI** Butler.

3. Porto Bello, February, 1911 (Busck); Trinidad River, March and June, 1912 (Busck).

**HAMEARIS EROSTRATUS** Doubleday and Hewitson.

1. Taboga Island, June, 1911 (Busck).

**HAMEARIS DOMINA** Bates.

3. Porto Bello, April, 1912 (Busck); Taboga Island, June, 1911 (Busck).

**THEOPE VIRGILIUS** Fabricius

1. Taboga Island, February, 1912 (Busck).

**THEOPE FOLIORUM** Bates.

2. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck).

## Family LYCAENIDÆ.

**THECLA DAMO** Druce.

1. Taboga Island, February, 1912 (Busck).

**THECLA HEMON** Cramer.

1. Alhajuelo, April, 1911 (Busck).

**THECLA AUFIDENA Hewitson.**

3. Paraiso, Canal Zone, January, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**THECLA PHALEROS Linnaeus.**

3. Taboga Island, February, 1912 (Busck).

**THECLA TOGARNA Hewitson.**

12. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**THECLA DOLYLAS Cramer.**

1. Cabima, May, 1911 (Busck).

**THECLA PALEGON Cramer.**

1. Porto Bello, April, 1912 (Busck).

**THECLA ERICUSA Hewitson.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**THECLA CYDRARA Hewitson.**

1. Trinidad River, March, 1912 (Busck).

**THECLA ECHION Linnaeus.**

3. Taboga Island, February, 1912 (Busck).

**THECLA HESPERITIS Butler and Druce.**

3. Taboga Island, February, 1912 (Busck); Porto Bello, April, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**THECLA BEON Cramer.**

19. Paraiso, Canal Zone, January, 1911 (Busck); Alhajuelo, April, 1911 (Busck) Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**THECLA TREBULA Hewitson.**

5. Trinidad River, March, 1912 (Busck); Porto Bello, April, 1912 (Busck).

**THECLA CERATA Hewitson.**

9. Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

**THECLA SYNCELLUS Cramer.**

1. Taboga Island, February, 1912 (Busck).

**THECLA POLITUS H. H. Druce.**

1. Alhajuelo, April, 1911 (Busck).

**THECLA XENETA Hewitson.**

3. Taboga Island, February, 1912 (Busck); Porto Bello, March, 1911 (Busck); Cabima, May, 1911 (Busck).

**THECLA TAREMA Hewitson.**

1. Tabernilla, Canal Zone, May, 1907 (Busck).

**THECLA ELIMES, new species.**

*Male.*—Costa of fore wing angled above base; black, light blue at base, sharply limited, two-thirds of cell, small area above base of vein 2 to inner margin before tornus. Hind wing all blue except costal area just encroaching on cell, then above vein 6 at margin. A long slender tail at vein 2, short one at 3. Below soft light gray. Fore wing with large area of rough scales covered by costal expansion of hind wing. An outer broken white line from subcostal to 2. Hind wing with outer line white, broken into spots, a large one above vein 7 edged within by black, forming a dentate line at 1b and 2; submarginal line parallel to the edge, blackish, powdery, in white irrorations, distinct near inner margin; a red spot with black center in interspace 2–3; black powderings on white in 1b–2. Expanse, 33–35 mm.

*Cotypes.*—Two males, No. 15756, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Apparently near *ecameda* Hewitson and *sichæus* Cramer.

**THECLA BURICA, new species.**

*Male.*—Bright blue; fore wing with large stigma in cell black, apex broadly black. Hind wing with a narrow black margin, becoming broad on inner margin. Long slender tail at vein 2. Beneath gray bronzy; fore wing with dark area in cell by transparency; outer line faint, white, dark-edged from subcoastal to 2. Hind wing with outer line irregular, segmented, forming a W at veins 1b to 3, white, edged by black within; black and white powderings submarginally from tornus to 3, no red; edge black, preceded by whitish. Expanse, 25 mm.

*Type.*—Male, No. 15757, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Apparently near to *leberna* Hewitson.

**THECLA CLIMICLES, new species.**

*Male.*—Fore wing with costa angled opposite cell; bright blue, shading to black at costa and margin. Hind wing blue, costa black to subcostal and 6 and margin narrowly; fringe white. A long tail at vein 2, short one at 3. Below white, scarcely gray tinted; fore wing with faint dusky outer line to vein 2. Hind wing with outer line angularly crenulate, faint, forming no W; submarginal line faint dusky, crenulate; a small red-edged black dot in interspace 2–3 and dot at tornus. Expanse, 25 mm.

*Type.*—Male, No. 15758, U.S.N.M.; Taboga Island, February, 1912 (Busck).

Resembles *dindymus* Cramer.

**THECLA POSETTA, new species.**

Fore wing angled opposite base of cell; black, shaded with lilacine blue over base to beyond middle. Hind wing blue shaded, except along margin; red scales and white dot at tornus. Below brownish gray; fore wing with the outer broad rusty brown band from costa to vein 2, running close beyond cell. Hind wing with similar broad band forming the inner edge of a white line that becomes a blunt W at veins 1b to 3, the dark edge of the inner limb narrow; submarginal line dusky, parallel to edge of wing; a red spot with black center in interspace 2-3; black patch on tornus preceded by white, then a red bar. Expanse, 27 mm.

*Type.*—Male, No. 15759, U.S.N.M.; Porto Bello ,April, 1912 (Busck).

Resembles *ecbatania* Hewitson.

**THECLA CALLIDES, new species.**

Brown-gray; fore wing uniform; hind wing slightly whitish bordered toward margin with red patch in interspace 2-3 and tornus and black one between; termen with white interlined with black. A long tail at vein 2, short one at 3, black, white-tipped. Below gray, slightly coppery; fore wing with white segmented outer line from costa to vein 2, preceded by a red border; subterminal line dusky, segmented. Hind wing with white outer line segmented, dislocated on vein 4, forming a W from 3 to margin, preceded by a rather broad red band; submarginal line dusky, forming an arc over a large red spot in interspace 2-3, red-edged next to tornus; black pupil in red spot placed outwardly; a black spot at tornus; black powdering between. Terminal line black, preceded by whitish. Expanse, 21 mm.

*Cotypes.*—Two females, No. 15760, U.S.N.M.; La Chorrera, April, 1912 (Busck); Trinidad River, March, 1912 (Busck).

Resembles *sangala* Hewitson. Possibly it is the female of *xeneta* Hewitson.

**THECLA HERALDICA, new species.**

Black; fore wing with blue tint at base; hind wing with large shining blue area occupying all but broad costal and inner areas and narrow outer margin. Tail at vein 2 filiform. Below gray, lighter on marginal area; fore wing with outer line from costa to vein 1, inangled in submedian, white, reddish gray within. Hind wing with a similar line, dislocated on vein 4, forming a shallow W between vein 3 and margin, with more red scales in the dark edge than on fore wing; a red spot with black center in interspace 2-3; red at tornus; terminal line black, preceded by white. Expanse, 20 mm.

*Type.*—No. 15761, U.S.N.M.; Porto Bello, April, 1912 (Busck).

Resembles *hycara* Hewitson.

**THECLA MESCA, new species.**

Grayish black. Hind wing with red crescent before a black spot in interspace 2-3, preceded and followed by clouded white crescents; a small red patch at tornus; terminal line black, preceded by white. Below whitish gray. Fore wing with outer line from costa to vein 2, white, preceded by gray; submarginal line clouded, segmented, dusky. Hind wing with mesial line white, preceded by reddish gray, segmented and dislocated by all the veins, the W slight, hardly more than the other dislocations, the bar 1b-margin black; termen broadly mottled, gray with a row of white crescents before and centrally; a large red patch in interspace 2–3 with black spot outwardly; tornus diffusedly red-scaled over black dot. Expanse, 27 mm.

*Type.*—No. 15762, U.S.N.M.; Taboga Island, June, 1911 (Busck).

Resembles *bebrycia* Hewitson and *chonida* Hewitson.

**LYCAENA HANNO Stoll.**

10. Paraiso, Canal Zone, January, 1911 (Busck); Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1911 (Busck).

## Family HESPERIIDÆ.

**PYRRHOPYGE PHIDIAS Linnaeus.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

**MYSORIA VENEZUELÆ Cramer.**

2. Ancon, Canal Zone (O. Celestine, B. G. Ireneo).

**EUDAMUS PROTEUS Linnaeus.**

1. Ancon, Canal Zone (B. G. Ireneo).

**EUDAMUS SIMPLICIUS Stoll.**

1. Ancon, Canal Zone (O. Celestine).

**EUDAMUS EURYCLES Hübner.**

4. Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck).

**EUDAMUS DORYSSUS Drury.**

1. Taboga Island, February, 1912 (Busck).

**EUDAMUS DORANTES Stoll.**

1. Taboga Island, June, 1911 (Busck).

**EUDAMUS CATILLUS Cramer.**

1. Taboga Island, February, 1912 (Busck).

**EUDAMUS ASINE Hewitson.**

1. Paraiso, Canal Zone, April, 1911 (Busck).

**GONIURUS COELUS Cramer.**

1. Taboga Island, February, 1912 (Busck).

**GONIURUS TALUS Cramer.**

1. Porto Bello, February, 1911 (Busck).

**SPATHILEPIA CLONIUS Cramer.**

2. Paraiso, Canal Zone, April, 1911 (Busck).

**TELEMIADES AMPHION Geyer.**

1. Taboga Island, February, 1912 (Busck).

**BUNGALOTIS SEBRUS Felder.**

1. Cabima, May, 1911 (Busck).

**CECROPTERUS NEIS Gmelin.**

6. Taboga Island, February and June, 1911 (Busck); Porto Bello, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

**COGIA CALCHAS Herrich-Schäffer.**

2. Trinidad River, March, 1912 (Busck); Taboga Island, June, 1911 (Busck).

The specimens are both males and very small (30 mm.).

**HYDRAENOMIA ORCINUS Felder.**

1. Porto Bello, February, 1911 (Busck).

**HYALOTHYRUS NELEUS Linnaeus.**

1. Alhajuelo, April, 1911 (Busck).

**LIGNYOSTOLA LACYDUS Druce.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**PYTHONIDES CERIALIS Cramer.**

1. Taboga Island, February, 1912 (Busck).

**PELLICIA THYESTES Godman and Salvin.**

2. Porto Bello, February, 1911 (Busck).

**CELAENORRHINUS VARIEGATUS Godman and Salvin.**

1. Taboga Island, February, 1912 (Busck).

**ACHYLODES COELIGINEA Mabille.**

2. Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck).

**ACHYLODES PLAUTIA Möschler.**

1. Alhajuelo, April, 1911 (Busck).

**ACHYLODES TERRENS Schaus.**

5. Taboga Island, February, 1912 (Busck).

**SOSTRATA SCINTILLANS Mabille.**

1. Alhajuelo, April, 1911 (Busck).

**SOSTRATA LEUCORHOA Godman and Salvin.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**PACHES LOXUS Westwood.**

5. Paraiso, Canal Zone, January, 1911 (Busck); Taboga Island, February, 1912 (Busck); Porto Bello, February, 1911 and April, 1912 (Busck).

**PACHES SUBALBATUS Plötz.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**EANTIS THRASO Hübner.**

1. Taboga Island, June, 1911 (Busck).

**CAMPTOPLEURA THERAMENES Mabille.**

1. Taboga Island, February, 1912 (Busck).

**CAMPTOPLEURA TISIAS Godman and Salvin.**

1. Alhajuelo, April, 1911 (Busck).

**STAPHYLUS MAZANS Reakirt.**

2. Taboga Island, February, 1912, and June, 1911 (Busck).

**STAPHYLUS EVIPPE Godman and Salvin.**

1. Trinidad River, March, 1912 (Busck).

**HELIOPETES ARSALTE Linnaeus.**

4. Paraiso, Canal Zone, February, 1911 (Busck); Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**HELIOPETES ALANA** Reakirt.

1. Taboga Island, February, 1912 (Busck).

**HESPERIA SYRICHTUS** Fabricius.

3. Paraiso, Canal Zone, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**HESPERIA NOTATA** Blanchard.

2. Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**APAUSTUS MENES** Cramer.

1. Porto Bello, March, 1911 (Busck).

**HYLEPHILA PHYLAEUS** Drury.

1. Porto Bello, April, 1912 (Busck).

**THYMELICUS ATHENION** Hübner.

8. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Porto Bello, March, 1911 and April, 1912 (Busck).

**CATIA PUSTULA** Hübner.

1. La Chonera, April, 1912 (Busck).

**PRENES NERO** Fabricius.

1. Taboga Island, June, 1911 (Busck).

**PARAIDES OCRINUS** Plötz.

2. Paraiso, Canal Zone, April, 1911 (Busck).

**OXYNTHES CORUSCIS** Herrich-Schäffer.

1. Alhajuelo, April, 1911 (Busck).

**RHINTHON ALUS** Godman and Salvin.

1. Alhajuelo, April, 1911 (Busck).

**LERODEA TRIPUNCTATA** Herrich-Schäffer.

1. Alhajuelo, April, 1911 (Busck).

**COBALUS VIRBIUS** Cramer.

3. Trinidad River, March, 1912 (Busck).

**COBALUS CANNAE** Herrich-Schäffer.

1. Paraiso, Canal Zone, February, 1911 (Busck).

**ONOPHAS COLUMBARIA** Herrich-Schäffer.

1. Taboga Island, February, 1912 (Busck).

**PERIMELES REMUS** Fabricius.

8. Taboga Island, February and April, 1912, June, 1911 (Busck).

**EUTYCHIDE MIDIA** Hewitson.

1. Trinidad River, 1912 (Busck).

**EUTYCHIDE PHAETUSA** Hewitson.

1. Trinidad River, June, 1912 (Busck).

**EUROTO LYDE** Godman and Salvin.

2. Taboga Island, February, 1912 (Busck); Cabima, May, 1911. (Busck).

**EUROTO MICYTHUS** Godman and Salvin.

1. Taboga Island, February, 1912 (Busck).

**LEREMA ACCIUS Smith and Abbot.**

1. Taboga Island, February, 1912 (Busck).

**METISCUS ATHEAS Godman and Salvin.**

1. Trinidad River, March, 1912 (Busck).

**THARGELLA FULIGINOSA Godman and Salvin.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**MNASITHIUS SIMPLICISSIMUS Herrich-Schäffer.**

3. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Porte Bello, March, 1911 (Busck).

**VEHILIUS VENOSUS Plötz.**

7. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck).

**MEGISTIAS LABDACUS Godman and Salvin.**

1. Porto Bello, March, 1911 (Busck).

**MEGISTIAS CERDO Boisduval.**

1. Alhajuelo, April, 1911 (Busck).

**CARYSTUS FANTASOS Cramer.**

2. Taboga Island, February and June, 1911 (Busck).

**PARACARYSTUS HYPARGYRA Herrich-Schäffer.**

1. Porto Bello, April 1912 (Busck).

**CALLIMORMUS JUVENTUS Scudder.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**CALLIMORMUS GRACILIS Felder.**

3. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March and June, 1912 (Busck).

**THRACIDES AROMA Hewitson.**

1. Trinidad River, March, 1912 (Busck).

**TAGIADES SERGESTUS Cramer.**

1. Ancon, Canal Zone (B. G. Ireneo).

## Superfamily SPHINGOIDEA.

### Family SPHINGIDÆ.

**HERSE CINGULATA Fabricius.**

3. Cabima, May, 1911 (Busck).

**COCYTIUS CLUENTIUS Cramer.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**COCYTIUS ANTAEUS MEDOR Cramer.**

2. Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**PROTOPARCE HANNIBAL Cramer.**

2. Cabima, May, 1911 Busck).

**PROTOPARCE LEFEBUREI Ménétriès.**

1. La Chorrera, May, 1912 (Busck).

**ERINNYIS ALOPE Merian.**

1. Cabima, May, 1911 (Busck).

**ERINNYIS ELLO** Linnaeus.

14. Paraiso Canal Zone, January, 1911 (Busck); Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**ERINNYIS ŒNOTRUS** Stoll.

3. Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**PACHYLIA FICUS** Linnaeus.

1. Trinidad River, May, 1911 (Busck).

**PACHYLIA DIRCETA** Druce.

1. Porto Belli, April, 1912 (Busck).

**PACHYLIA RESUMENS** Walker.

1. Taboga Island, February, 1912 (Busck).

**ENYO JAPIX** Cramer.

1. Cabima, May, 1911 (Busck).

**ALEURON NEGLECTUM** Rothschild.

1. Cabima, May, 1911 (Busck).

**EPISTOR LUGUBRIS** Linnaeus.

3. Porto Bello, February, 1911 (Busck); Paraiso, Canal Zone, January, 1911 (Busck).

**EPISTOR OCYPETE** Linnaeus.

2. Paraiso, Canal Zone, May, 1911 (Busck).

**SESIA FADUS** Cramer.

2. Paraiso, Canal Zone, January, 1911 (Busck); Ancon, Canal Zone (B. G. Ireneo).

**SESIA TITAN** Cramer.

2. Paraiso, Canal Zone, January, 1911 (Busck); La Chorrera, April, 1911 (Busck).

**PHOLUS LICAON** Cramer.

3. Porto Bello, March, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**PHOLUS VITIS** Merian.

1. La Chorrera, May, 1912 (Busck).

**PHOLUS EACUS** Cramer.

1. Porto Bello, March, 1911 (Busck).

**XYLOPHANES PLUTO** Fabricius.

5. Porto Bello, March, 1911 (Busck); Cabima, May, 1911 (Busck); Paraiso, Canal Zone, May, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**XYLOPHANES PISTACINA** Boisduval.

1. Taboga Island, February, 1912 (Busck).

**XYLOPHANES NEACHUS** Cramer.

1. Paraiso, Canal Zone, January, 1911 (Busck).

**XYLOPHANES LIBYA** Druce.

1. Trinidad River, March, 1912 (Busck).

**XYLOPHANES TERSA Linnæus.**

2. Cabima, May, 1911 (Busck); Paraiso, Canal Zone, May, 1911 (Busck).

**XYLOPHANES TITANA Druce.**

2. Cabima, May, 1911 (Busck); Paraiso, Canal Zone, May, 1911 (Busck).

**XYLOPHANES TURBATA Edwards.**

1. La Chorrera, May, 1912 (Busck).

## Superfamily SATURNOIDEA.

### Family SATURNIIDÆ.

**ROTHSCHILDIA LEBEAUI Guerin.**

1. La Chorrera, May, 1912 (Busck).

**DIRPHIA EUMEDIDE Stoll.**

1. Trinidad River, May, 1911 (Busck).

**DIRPHIA AGIS Cramer.**

1. Trinidad River, March, 1912 (Busck).

**DIRPHIA HIRCIA Cramer.**

1. Porto Bello, April, 1912 (Busck).

**DIRPHIA SPECIOSA Cramer.**

14. Porto Bello, February, 1911 (Busck); Paraiso, Canal Zone, May, 1911 (Busck); La Chorrera, May, 1911 (Busck).

**MOLIPPA SABINA Walker.**

2. Paraiso, Canal Zone, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**DYSDÆMONIA TAMERLAN Maassen.**

1. La Chorrera, May, 1912 (Busck).

**AUTOMERIS JANUS Cramer.**

1. Paraiso, Canal Zone, May, 1911 (Busck).

**AUTOMERIS CINCTISTRIGA Felder.**

1. Cabima, May, 1911 (Busck).

**AUTOMERIS JUNONIA Walker.**

3. Porto Bello, February, 1911 (Busck); Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**AUTOMERIS MERIDANA Schaus.**

1. Cabima, May, 1911 (Busck).

**GAMELIA NAUSICAA Cramer.**

3. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**GAMELIA IRMINA Cramer.**

3. Alhajuelo, April, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**HYLESIA SCHAUSI Dyar.**

1. Cabima, May, 1911 (Busck).

**HYLESIA INVIDIOSA, new species.**

Soft gray; discal mark a dark cloud; lines pale, indistinct, converging toward inner margin; marginal space pale on lower half. Hind wing with a single pale band, nearly straight, situated just beyond the end of the cell. Abdomen with ocherous hair, especially dorsally. Expanse, 32–34 mm.

*Cotypes.*—Two males, No. 15764, U.S.N.M.; Taboga Island, February, 1912 (Busck).

Comes nearest to *athlia* Dyar, but smaller, the fore wing not rounded at apex; markings less distinct, the line on hind wing straighter and even nearer the cell.

**HYLESIA CRESSIDA Dyar (?).**

4. Taboga Island, February and June, 1912 (Busck).

The specimens are more rosy than *alinda* before me from Costa Rica and the fore wing less falcate, agreeing with *cressida;* but all the specimens are males, and without a female can not be placed with certainty.

**HYLESIA sp. A.**

11. Taboga Island, January, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (A. H. Jennings).

This form lies near *pollex* Dyar, *umbrata* Schaus, and *valvex* Dyar, without agreeing entirely with either. The specimens are all in poor condition, so that a positive identification is unsafe. Mr. Busck sent up two distinct species of *Hylesia* larvæ, but made no association of them with adults.[1]

**HYLESIA sp. B.**

2. Cabima, May, 1911 (Busck).

Two females, close to *schausi* Dyar, but less coarse in appearance, less distinctly marked; the discal spots are more distinct than the bands. There are in the collection three other females of the same character, one from Chiriqui, one from Guapiles, Costa Rica, and one from Sixola River, Costa Rica. The Costa Rican females were tentatively labeled by Mr. Schaus as females of his *rubrifrons* and *dalina*, respectively, but they do not possess the red feet of these forms. The present form must await the association of males for positive identification.

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[1] Since writing the above, I have received a bred female in good condition from Dr. S. T. Darling, together with preserved larvæ, the latter conspicuously different from either of the larvæ sent by Mr. Busck. Doctor Darling found the larvæ on a Cashew tree (Anacardiaceæ) and bred the adults. The form may be named **Hylesia darlingi**, new species.

Closest to *H. pollex* Dyar from Venezuela; markings less bright and contrasted in the male; both sexes with the costa concolorous with the paler part of the wing, not with a strong dark shade as in *pollex:* discal spots of both wings clouded and more obscure than in *pollex;* abdomen of female without the paler ocherous posterior lateral tufts, the hairs concolorous with the rest of the lateral ones.

*Type.*—Female, No. 16038, U.S.N.M.; Ancon, Canal Zone, April, 1913 (S. T. Darling).

*Larva.*—Head rounded, about as wide as high, smooth, cherry-red, the tips of the mandibles and a spot on each side of labrum black. Body robust, cylindrical, tapering a little anteriorly; whitish, with black angular marks and spots; dorsal line forming a series of dashes intersegmentally and little specks in the centers of the segments; two joined subdorsal and lateral blotches in segmental incisures, a ring around subdorsal horns, spot below laterals, and lateral dot and dash on posterior third of segment; spiracles brown with irregular black dashes between; below a broad straight pale substigmatal area, then a blackish broken and vacuolated subventral band, the venter itself pale. Thoracic feet reddish; abdominal ones pale with black claspers. Horns whitish with pale branches and hairs, subdorsal, lateral, and substigmatal rows and single dorsal one on joints 12 and 13, none on anal plate, which is light reddish with black area before it on joint 13. No cervical shield. Horns all about the same length, the anterior and posterior ones but slightly longer and slenderer, none as long as the diameter of the body.

**HYLESIA sp. C.**

1. La Chorrera, May, 1912 (Busck).

One female similar to the above but much darker, the lines slender and distinct; apex very dark with light lilacine spot. It does not agree with anything before me, but description from the single female seems inadvisable.

**LONOMIA CYNIRA** Cramer.

3. La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**THERINIA TRANSVERSARIA** Druce.

1. Porto Bello, April, 1912 (Busck).

**OXYTENIS HONESTA** Cramer.

1. Trinidad River, March, 1912 (Busck).

**DRACONIPTERIS MIRABILIS** Cramer.

1. Cabima, May, 1911 (Busck).

**DRACONIPTERIS GIGANTEA** Druce.

1. Trinidad River, June, 1912 (Busck).

Druce described a very pale female from Ecuador as *Teratopteris gigantea.* The present specimen is probably conspecific, though small and very dark.

## Family CITHERONIIDÆ.

**CITHERONIA MEXICANA** Grote and Robinson.

1. Porto Bello, April, 1912 (Busck).

**CITHERONIA MARION**, new species.

Thorax yellow with faint orange edgings to patagia and collar; below orange-brown; abdomen banded yellow and red. Fore wing yellow, a yellow patch at base, the rest of basal space filled in with purple; scattered purple clouds in mesial space with four angular dots surrounding discal cross-vein; subterminal space lightly powdered with purple; terminal space solidly purple filled. Hind wing with red discal dot and lightly curved outer line, touching tornus and apex at extremities, narrowly separated from discal dot; a slight red patch near inner margin below cell. Beneath yellow, costa and terminal space of fore wing only purple. Large red discal and basal dots on both wings. Expanse, 84 mm.

*Type.*—Male, No. 15836, U.S.N.M.; Trinidad River, June, 1912 (Busck).

This is probably a subspecies of *C. laocoon* Cramer.

**EACLES MAGNIFICA** Walker.

2. Paraiso, Canal Zone, April, 1911 (Busck).

**SYSSPHINX MOLINA** Cramer.

2. Cabima, May, 1911 (Busck); Paraiso, Canal Zone, May, 1911 (Busck).

**ADELOCEPHALA ADOCIMA**, new species.

Fore wing dark gray-brown; a white triangular patch at base; outer line faintly indicated, nearly parallel to outer margin, starting from costa at outer fifth, retreating a little below, relieved at costa by a triangular violaceous shade within. Abdomen ocher-brown. Expanse, 83 mm.

*Type.*—Female, No. 15766, U.S.N.M.; Cabima, May, 1911 (Busck).

## Superfamily BOMBYCOIDEA.

### Family SYNTOMIDÆ.

**POMPILIODES ALIENA** Walker.

3. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1911 (Busck).

**ISANTHRENE CRABRONIFORMIS** Staudinger.

1. Alhajuelo, April, 1911 (Busck).

**PHEIA ALIBISIGNA** Walker.

1. Cabima, May, 1911 (Busck).

**PHEIA UTICA** Druce.

1. Trinidad River, March, 1912 (Busck).

**PHEIA STRATIOTES**, new species.

Black, with many yellow spots; front, vertex, tegulæ, streak on patagia, spot in center of thorax, two behind, all of constricted base of abdomen, band on posterior edge of each segment, interrupted dorsally, and venter yellow. Palpi and legs darker yellow, the latter streaked with black. Antennæ black, yellow in the middle, wings yellow hyaline, veins black; fore wing with orange spot at base, an apical black patch and very narrow outer and inner borders. Hind wing with narrow apical border. Expanse, 23–25 mm.

*Cotypes.*—Three males, No. 15771, U.S.N.M.; Trinidad River, March, 1912 (Busck); Cabima, June, 1911 (Busck).

The abdomen is distinctly constricted at the base, but the other characters agree with *Pheia*.

**LOXOPHLEBIA LEUCOTHEMA**, new species.

Above as in *L. imitata* Druce; abdomen beneath black, the ventral valve white. Expanse, 18–20 mm.

*Cotypes.*—Three males, No. 15767, U.S.N.M.; Trinidad River, June, 1911 (Busck); Caura Valley and Aroa, Venezuela (Schaus collection).

**MESOTHEN PYRRHA** Schaus.

1. Corozal, Canal Zone, March, 1911 (Busck).

**PHŒNICOPROCTA RUBIVENTER** Hampson.

1. Paraiso, Canal Zone, June, 1911 (Busck).

**PHŒNICOPROCTA PAUCIPUNCTA, new species.**

Black; patches of metallic blue on fore coxæ, front, vertex, tegulæ, base of wing, metathorax, and lateral row on abdomen, the central spots of latter small; an orange patch dorsally on fourth segment and small one on fifth; a band on fourth ventrally; anal tuft black. Wings hyaline, veins black; a black marginal band on fore wing expanded at apex and tornus; subcostal orange streak and orange patch at base of inner margin, cut by vein 1. Hind wing with marginal band widened at apex and tornus. Discocellulars of hind wing angled. Expanse, 35 mm.

*Type.*—Male, No. 15679, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**SAROSA MORA Schaus.**

1. Porto Bello, April, 1912 (Busck).

Differs from *mora* in having a broad black apex to fore wing, but agrees otherwise.

**HOMŒOCERA STICTOSOMA Druce.**

1. Cabima, May, 1911 (Busck).

**COSMOSOMA SEMIFULVA Druce.**

4. Trinidad River, March, 1912, and June, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**COSMOSOMA REMOTA Walker.**

1. Trinidad River, March, 1912 (Busck).

**COSMOSOMA HERCYNACULA, new species.**

Like *C. hercyna* Druce, but smaller, the apical black patch of fore wing with straight inner edge, not arcuate. Expanse, 20–22 mm.

*Cotypes.*—Two males, No. 15772, U.S.N.M.; Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**COSMOSOMA MELANOTELA, new variety.**

Abdomen with small black tip; else as in *hercynacula*.

*Cotypes.*—Two males, No. 15773, U.S.N.M.; Cabima, May, 1911 (Busck).

**SAURITA TEMENUS Stoll.**

1. Trinidad River, March, 1912 (Busck).

**SAURITA PHŒNICOSTICTA Druce.**

1. Cabima, May, 1911 (Busck).

**SAURITA TIPULINA Hübner.**

4. Alhajuelo, April, 1911 (Busck); Porto Bello, May, 1911 (Busck); Paraiso, Canal Zone, June, 1911 (Busck).

**DINIA ÆAGRUS Cramer.**

2. Taboga Island, February, 1912 (Busck); Porto Bello, March, 1911 (Busck).

**ANDROCHARTA MEONES Stoll.**

2. Trinidad River, March, 1912 (Busck).

**DYCLADIA MAMHA, new species.**

Head and thorax orange above with median dorsal black stripe. Abdomen black with large blue metallic lateral patches, orange at base; palpi orange, the joints tipped with black; legs black, fore femora pale orange, fore coxæ metallic blue. Wings hyaline, tinged with orange; veins, costa and margin orange; a large round black discal spot; apex and tornus black; a sordid orange patch at bases of veins 2–4. Hind wing hyaline with black terminal border, wider at apex and tornus. Expanse, 32 mm.

*Type.*—Male, No. 15770, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**HYPOCHARIS CLUSIA Druce.**

1. La Chorrera, May, 1912 (Busck).

**RHYNCHOPYGA FLAVICOLLIS Druce.**

1. La Chorrera, May, 1912 (Busck).

**PSOLOPTERA THORACICA Walker.**

4. Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); Porto Bello, May, 1912 (Busck).

**MACROCNEME AURIPES Walker.**

2. Cabima, May, 1911 (Busck).

**MACROCNEME CHRYSOTARSIA Hampson.**

7. Taboga Island, February, 1912, and June, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**MACROCNEME LADES Cramer.**

1. Taboga Island, February, 1912.

**MACROCNEME LADES CABIMENSIS, new subspecies.**

Hind tibiæ with long fringe of hair above and short one below on inner side; antennæ of female with short branches; fringe of hind tarsi white on top of first and all succeeding joints. Fore wing with short blue streaks at base and a row of them across middle.

*Cotypes.*—Two females, No. 15768, U.S.N.M.; Cabima, May, 1911 (Busck).

Also a broken and worn specimen, apparently the same, Paraiso, Canal Zone, February, 1911.

**MACROCNEME LACONIA Druce.**

1. Taboga Island, February, 1912 (Busck).

**MACROCNEME INDISTINCTA Butler.**

2. La Chorrera, May, 1912 (Busck).

**CALONOTOS TIBURTUS Cramer.**

3. Porto Bello, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**NAPATA LEUCOTELUS Butler.**

4. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1911 (Busck); Cabima, May, 1911 (Busck).

**ACLYTIA HEBER Cramer.**

1. Trinidad River, March, 1912 (Busck).

**ACLYTIA PUNCTATA** Butler.

1. Trinidad River, March, 1912 (Busck).

**TEUCER ATEUCER**, new species.

Fore wing straw-color, irrorate with brown; a brown shade at base; a faint curved inner line; small double discal dot preceded by a shade on costa; an oblique band from outer third of inner margin to apex; a round black spot on tornus; small terminal dots. Hind wing soiled whitish, with small fuscous discal spot and faint terminal shading; fringe dotted as on fore wing. Expanse, 24 mm.

*Type.*—Female, No. 15777, U.S.N.M.; La Chorrera, May, 1912 (Busck).

This species disagrees with *Teucer* in venation, having 6 of fore wing arising far below angle of cell, 6 and 7 of hind wing separate, 4 and 5 from a point; but two of these divergencies are shown in *Teucer brunnea* Hampson, which this species resembles.

**EPISCEPSIS LENÆUS** Cramer.

1. Alhajuelo, April, 1911 (Busck).

**DELPHYRE ELACHIA**, new species.

Head, thorax and fore wing brown. Hind wing and abdomen blackish gray. Legs brown; antennæ blackish. Expanse, 16 mm.

Hind wing with veins 6 and 7 separate; 5 fully developed from lower angle of cell; 3 and 4 coincident; 2 from long before angle of cell. Fore wing with 3 and 4 long-stalked; 5 from lower angle of cell; 9 absent. Abdomen not constricted at base.

*Type.*—Female, No. 15778, U.S.N.M.; La Chorrera, May, 1912 (Busck).

Resembles *D. hebes* Walker, but smaller.

**DELPHYRE HEBES** Walker.

1. Tabernilla, Canal Zone, May, 1907 (Busck).

**DELPHYRE CUMULOSA**, new species.

Fore wing lilacine gray with large round brown spots in rows; spot at base, inner row curved, median row doubled at end of cell, a large blotch at lower corner of cell, single row below, outer row fused into a wedge-shaped band above, single and somewhat dislocated below vein 2; subterminal row close to margin; a row of dots in fringe. Hind wing soiled pale yellow. Head and thorax gray with narrow crimson ring in neck; abdomen pale ocher above, without spots. Expanse, 25 mm.

*Cotypes.*—Two males, No. 15774, U.S.N.M.; La Chorrera, May, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

**PTYCHOTRICHOS EPISCEPSIDIS**, new species.

Black-brown; two spots on back of head and whole venter of thorax narrowly crimson; abdomen black, with large lateral metallic blue spots. Fore wing brown-black. Hind wing hyaline-white at base, veins and broad margin black; the cell black above, leaving the white spots in lower part of cell, one large one beyond and two smaller ones between base of veins 2–5. Male with straw-colored hair pencil at base of hind tibia. Expanse, 38 mm.

*Type.*—Male, No. 15776, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**HELIURA BANOCA new species.**

Black, mixed with olive fuscous; patagia and thorax striped; two large crimson dots at back of head; fore coxæ whitish. Abdomen black above, white below, except at tip. Fore wing olive-fuscous with white-hyaline patches, one in cell, a long one below, a row of four beyond, black spots in rows between the veins filling up most of the rest of wing, leaving only narrow lines between. Hind wing white-hyaline at base with broad black border. In the male the tornus of hind wing is produced a little and rounded, with erect fuscous scales and a broad border of the same beneath to vein 5. Expanse, 21 mm.

*Type.*—Male, No. 15775, U.S.N.M.; Trinidad River, March,1912 (Busck).

**EUCEREON HYALINUM Kaye.**

1. Trinidad River, June, 1912 (Busck).

**EUCEREON LATIFASCIATA Walker.**

1. Trinidad River, March, 1912 (Busck).

**EUCEREON ROGERSI Druce.**

1. Alhajuelo, April, 1911 (Busck).

**CORREBIA LYCOIDES Walker.**

1. Alhajuelo, April, 1911 (Busck).

## Family LITHOSTIDÆ.

**HYPAREVA POGONODA Hampson.**

1. Cabima, May, 1911 (Busck).

**APTILOSIA CROCEA Schaus.**

3. Trinidad River, March, 1912 (Busck); Porto Bello, April, 1912 (Busck).

**AGYLLA BIOPTERA, new species.**

*Male.*—Palpi yellow with dark tips; front white; vertex, thorax, and abdomen gray, and tuft black. Fore wing silvery white, broadly dark gray along inner margin. Hind wing white. Beneath, fore wing gray, darker on inner margin; a broad ocherous area over cell and outwardly, staining veins 2, 3, and 4. Expanse, 20 mm.

*Female.*—Palpi, head, and thorax as in the male; abdomen gray above, without anal tuft. Fore wing as in the male above; below, white with gray about tornus only. Expanse, 22 mm.

*Cotypes.*—Four males, three females, No. 15781, U.S.N.M.; Trinidad River, March and August, 1912 (Busck); La Chorrera, May, 1912 (Busck); Cabima, May, 1911 (Busck).

**AGYLLA SERICEA** Druce.

23. Porto Bello, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**AGYLLA NIPHOSTIBES,** new species.

Palpi ocher, blackish at tip. Silvery white, fore wing shining, hind wing semitranslucent. Head dark gray in front, vertex white; antennæ ocher, shortly pectinated in the male. Thorax white. Abdomen white; anal tuft of male tinted with sordid ocher. Legs whitish, fore femora yellow, fore tibiæ and tarsi fuscous. Costa of male very narrowly and faintly ocher; of female, white. Expanse, 40–46 mm.

*Cotypes.*—Four males, one female, No. 15782, U.S.N.M.; Cabima, May, 1911 (Busck).

This falls in *Agylla nivea* Walker by Hampson's monograph;[1] but Walker says of *nivea,* "Head black above, luteous in front" and "abdomen testaceous above." Of the synonyms given by Hampson, *monoleuca* Walker has "palpi fawn color;" *argentea* Felder has the vertex of head yellow, collar shaded with purplish fuscous; *virginea* Schaus is a small form with pale ocher vertex and collar and abdomen gray dorsally; *plateada* Dognin is like *argentea* Felder, but with ocherous abdomen instead of white; *florecilla* Dognin has the vertex of the head as well as the whole front and collar gray. None of the described forms, therefore, agree with the one before me. I have two males and three females of *niphostibes* also from the Guianas, collected by Mr. Schaus.

**APISTOSIA JUDAS** Hübner.

5. La Chorrera, May, 1912 (Busck).

**BALBURA DORSISIGNA** Walker.

1. La Chorrera, May, 1912 (Busck).

**DOLICHESIA FALSIMONIA** Schaus.

3. Cabima, May, 1911 (Busck).

**ACHROOSIA NUDA** Hampson.

5. Alhajuelo, March, 1912 (Busck); Trinidad River, March, 1912, and May, 1911 (Busck).

**THYONE SIMPLEX** Walker.

37. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912, and June (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek and C. P. Crafts).

**THYONE GRISESCENS** Schaus.

13. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1912 (Busck); Trinidad River, March and June, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

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[1] Cat. Lep. Phal. Brit. Mus., vol. 2, 1900, p. 195.

**AFRIDA GYMNES, new species.**

Fore wing grayish white, white irrorated with olive yellow; a subbasal oblique half-line from costa, dark gray; a small square patch on middle of costa, connected by a slender, broken dentate outcurved line to a triangular patch on inner margin; a large diffused patch on termen forming a larger triangular patch above and a smaller one below, joined; terminal black dots. Hind wing soft grayish fuscous, with faint darker border and central line, the latter crossing the obscure discal dot. Fringe pale. Expanse, 12 mm.

*Cotypes.*—Seven specimens, No. 15793, U.S.N.M.; La Chorrera, May, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

**AFRIDA PNIXIS, new species.**

Base of fore wing dark, heavily blackish irrorate, followed by a broad band of grayish white, limited by a zigzag black line, and running in toward base on inner margin; median space irrorated with gray, limited by a line similar to the inner one, running from apex inward, then downward to inner margin before tornus; the line is followed by white below, but above touches the blackish marginal marking, which becomes purplish toward apex; marginal dots not relieved. Hind wing uniformly dark grayish fuscous. Expanse, 11 mm.

*Type.*—Male, No. 15794, U.S.N.M.; Cabima, May, 1911 (Busck.)

## GAUDEATOR, new genus.

Fore wing with vein 3 before angle of cell; 4 and 5 well separated, 6 below upper angle of cell; 7 to 9 stalked, 7 after 9; 10 and 11 free, 11 somewhat curved. Hind wing with 3 and 4 from angle of cell, 5 from middle of cross vein, 6 and 7 long-stalked, 8 from middle of cell. Hind tibiæ with four spurs; palpi short, slender, upturned to middle of frons; tongue distinct.

*Type of the genus.*—*Gaudeator paidicus*, new species.

**GAUDEATOR PAIDICUS, new species.**

Yellow; abdomen more or less red dorsally. Fore wing yellow; a purple-black bar near base to vein 1; an oblique inner band joined by a longitudinal bar to a curved outer one to costa; outer band broken below this bar, its lower segment lying parallel upon inner margin next tornus. Hind wing pink with yellow fringe. Expanse, 13 mm.

*Type.*—Male, No. 15783, selected from 38 specimens, Cabima, May, 1911 (Busck). Other specimens from Porto Bello, April, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, March and June, 1912 (Busck).

Resembles *Nudur fractivittarum* Dyar.

**LYCOMORPHODES SORDIDA Butler.**

12. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Porto Bello, April and May, 1912 (Busck);

Tabernilla, Canal Zone, May, 1907 (Busck); Cabima, May, 1911 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**MULONA PHELINA Druce.**

18. Trinidad River, March, May, and June, 1912 (Busck); Porto Bello, April, 1912, and May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**PREPIELLA AUREA Butler.**

14. Taboga Island, February, 1912 (Busck); Porto Bello, April, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

Hampson figures[1] the venation with veins 3 and 4 long-stalked in hind wings. They are in reality separate or connate, the cell making a long angle toward margin, wrongly shown in the figure. Vein 5 also is short and curved.

**ODOZANA SIXOLA Schaus.**

7. Trinidad River, March, 1912 (Busck); Porto Bello, March, 1911 (Busck); Cabima, May, 1911 (Busck).

All the specimens are males, the female being unknown.

### PALÆOZANA, new genus.

Fore wing with veins 2 and 3 from well before angle of cell; 4 and 5 from a point; 6 from apex of cell; 7 to 9 stalked, 7 beyond 9; 10 and 11 free, oblique. Hind wing with 2 before angle of cell; 3 to 5 stalked, 4 and 5 coincident; 6 and 7 stalked; 8 near end of cell. Palpi slender, upturned; tongue strong; hind tibiæ with four spurs. Falls with *Pachycerosia* in the table, but the costa is not strongly arched at base.

*Type of the genus.*—*Palæozana mida*, new species.

**PALÆOZANA MIDA, new species.**

Dark slate gray; tegulæ crimson; palpi pale. Fore wing blackish slate. Hind wing crimson with outer even black border. Below this area covered with raised orange scales and a row of orange hairs subcostally. Abdomen crimson with very large anal and lateral tufts, crimson at the sides, orange in the center. Expanse, 15 mm.

*Cotypes.*—Three males, No. 15786, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**ILLICE LEUCONOTUM, new species.**

Head and thorax white; abdomen crimson dorsally, not tufted. Fore wing gray, washed with white, the gray persisting as borders to creamy white spots, of which one, semicircular, is on outer third of costa and two elongate ones on inner margin, nearly joined centrally and together reaching from base to tornus. Hind wing crimson with small gray tip at apex, no prolongation at tornus, Expanse, 10 mm.

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[1] Cat. Lep. Phal. Brit. Mus., vol. 2, 1900, p. 358.

*Type.*—Male, No. 15785, U.S.N.M.; La Chorrera, April, 1912 (Busck.)

**ILLICE MINUTA** Butler.

1. Cabima, May, 1911 (Busck).

Smaller than the unique female type (male, 11 mm.), but agreeing well otherwise with Hampson's description and figure.[1]

**ILLICE OPULENTA** Walker.

4. Cabima, May, 1911 (Busck); Porto Bello, October and December, 1912 (G. F. Cleveland).

**DIARHABDOSIA COROIDES** Schaus.

15. Tabernilla, Canal Zone, May, 1907 (Busck); Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

All the specimens are females.

**PARAPREPIA FUSCILINGUA**, new species.

Head and palpi blue-gray; tegulæ crimson; tongue dark brown; thorax and abdomen dark blue-gray. Fore wing slaty gray-blue, shaded on inner third. Hind wing slaty black. Expanse, 15 mm.

*Cotypes.*—Male and female, No. 15784, U.S.N.M.; Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**NODOZANA THRICOPHORA** Hampson.

9. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**NODOZANA PICTURATA** Schaus.

1. La Chorrera, May, 1912 (Busck).

**NODOZANA ALBULA**, new species.

White; fore wing irrorated with luteous, with an indistinct patch of darker scales above vein 6 beyond cell and a diffuse elongate black patch in submedian space beyond middle. Hind wing pale gray. Abdomen pale gray, with large white terminal tuft. Expanse, 11 mm.

*Type.*—Female, No. 15803, U.S.N.M.; without label (Busck).

In appearance resembles *Saozana leucota* Hampson.

### SERINCIA, new genus.

Fore wing with vein 2 from long before angle of cell; 3 to 5 well spaced; 7 to 9 stalked; 8 and 9 coincident; 10 and 11 free. Hind wing with 3 and 4 moderately stalked, 5 absent, 6 and 7 stalked, 8 from middle of cell. Hind tibiæ with four spurs. Palpi obliquely porrect, exceeding the front; tongue well developed. Falls in *Cincia* in the table, but differs in the absence of vein 9.

*Type of the genus.*—*Serincia metallica*, new species.

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[1] Cat. Lep. Phal. Brit. Mus., vol. 2, 1900, p. 369, pl. 29, fig. 17.

**SERINCIA METALLICA, new species.**

Fore wing bright metallic green. Hind wing dull black. Body parts black, the head and thorax green. Expanse, 16 mm.

*Type.*—Female, No. 15787, U.S.N.M.; Tabernilla, Canal Zone, May, 1907 (Busck).

**LYCOMORPHODES GENIFICANS, new species.**

Dark slate gray; abdomen dorsally crimson. The fore wing under a lens has numerous rough, white scales, tipped with black. The hind wing is nearly black without the slaty tint. Expanse, 13–14 mm.

*Cotypes.*—Seven females, No. 15789, U.S.N.M.; Trinidad River, March, May, and June, 1912 (Busck).

Like *Talara rugipennis* Schaus, but differing in the pronounced stalking of veins 4 and 5 of fore wing.

**TALARA MELANOSTICTA, new species.**

Slate gray; fore wing pale slate gray, showing under lens many whitish scales with black tips. Hind wing with veins 3 and 4 stalked, a little browner in tone than fore wing, with a large velvety black patch of androconia filling the cell and extending above and beyond it. Expense, 15–16 mm.

*Cotypes.*—Two males, No. 15790, U.S.N.M.; Cabima, May, 1911 (Busck).

**TALARA MINYNTHADIA, new species.**

Brown, tinged with submetallic black; neck and basal joint of antennæ yellow; abdomen crimson above, anal tuft mixed crimson, orange, and black. Fore wing slaty brown with bluish black shade along costa and across middle, broadly so beneath, leaving only base and apex of slate. Hind wing crimson, apical half brown-black, narrowing to a point before tornus. Expanse, 15 mm.

*Type.*—Male, No. 15791, U.S.N.M.; La Chorrera, May, 1912 (Busck).

Two females, tentatively associated with the male type, lack the dark shading of fore wing above and below, the wing being dark slaty blackish without marks on either surface. Crimson area of hind wing more restricted than in the male, occupying about the basal third.

La Chorrera, May, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

**TALARA VIOLESCENS, new species.**

Dark slaty brown; fore wing with shining violet tint, uniform. Hind wing black, basal third crimson. Abdomen crimson, the large anal tuft blue-black. Expanse, 16 mm.

*Type.*—Male, No. 15792, U.S.N.M.; Cabima, May, 1911 (Busck).

**TALARA PHÆELLA Hampson.**

7. Trinidad River, March, 1912, and May, 1911 (Busck); Corozal, Canal Zone, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**TALARA MESOSPILA, new species.**

Head and thorax white; abdomen crimson. Fore wing white; a brown patch at basal one-third of inner margin and another oblique one on tornus. Hind wing crimson. Expanse, 11 mm.

*Type.*—Male, No. 15797, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**TALARA MONA, new species.**

Fore wing gray, variegated with whitish scales, especially on lower half; inner line pale, faint, forming three small pale spots; subterminal line dark, straight, bent at vein 6, followed by a light mark at tornus and fringe and two dots on costa, one before, one after. Hind wing crimson at base, apex broadly dark gray, running as narrow border to tornus. Body gray; abdomen crimson dorsally. Expanse, 11 mm.

*Type.*—Male, No. 15796, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Allied to *unimoda* Schaus and *diversa* Schaus, rather intermediate between them.

### ABROCHOCIS, new genus.

Fore wing with veins 2 and 3 from before angle of cell, 4 and 5 long-stalked, 7 to 9 stalked, 7 before 9, 10 free, 11 anastomosing with 12. Hind wing with vein 2 from before angle of cell, 3 and 4 coincident, 5 from lower angle of cell, 6 and 7 coincident, 8 before middle of cell. It falls in the table with *Barsinella* Butler, differing in veins 3 and 4 of fore wing being stalked and 6 and 7 of hind wing coincident.

*Type of the genus.*—*Talara esperanza*[1] Schaus.

**ABROCHOCIS ESPERANZA Schaus.**

12. Tabernilla, Canal Zone, May, 1907 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**BARSINELLA DESETTA, new species.**

Fore wing orange, tinged with red; crimson discal bar and termen; three black dots beyond base followed by four digitate streaks, then the inner line, thrice dentate, central tooth largest; outer line with one long tooth, followed by eight streaks on the veins. Hind wing crimson with apical black spot; fringes orange tinted. Expanse, 9 mm.

*Type.*—Female, No. 15797, U.S.N.M.; La Chorrera, May, 1912 (Busck).

### GERIDIXIS, new genus.

Generic characters of *Chrysochlorosia* Hampson, by the table, but vein 11 free, oblique, not anastomosing with 12, cell of hind wing moderate, etc.

*Type of the genus.*—*Geridixis minx*, new species.

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[1] Ann. Mag. Nat. Hist. (8), vol. 7, 1911, p. 365.

**GERIDIXIS MINX, new species.**

White; abdomen tinged with sordid. Fore wing white with scattered ocherous shadings; a large oval black patch occupying a large part of the wing, leaving the costal third white and a narrow space along margin and around tornus. Hind wing pale fuscous, the fringes white. Expanse, 14 mm.

*Type.*—Male, No. 15788, U.S.N.M.; Trinidad River, June, 1912 (Busck).

Resembles in appearance *Paratalara inversa* Schaus.

**CLEMENSIA QUINQUIFERANA Walker.**

3. Trinidad River, March, 1912 (Busck); Porto Bello, April, 1912 (Busck).

There appear to be several species mixed up under this name, but the material is not in good enough quality to enable a separation.

## ANÆNE, new genus.

Palpi upturned, second joint densely fringed with scales in front, the third small, concealed by the scales, reaching nearly to vertex of head. Tongue moderately well developed. Hind tibiæ with very long spurs. Fore wing rather narrow, apex depressed, pointed or slightly falcate. Fore wing with veins 2 and 3 from well before angle of cell, 4 and 5 from a point, 6 shortly below upper angle of cell, 7 to 10 stalked, 7 before 10, 11 free, oblique. Hind wing with 2 long before angle of cell, 3 and 4 stalked, 5 above middle of discocellulars, 6 and 7 stalked, 8 from the middle of the cell.

*Type of the genus.*—*Anæne spurca*, new species.

**ANÆNE SPURCA, new species.**

Fore wing whitish, costa dark brown; costal third shaded with gray, cut by two rather broad white lines, of which the inner is oblique, the outer bent outwards a little above the middle; a triangular brown patch on inner margin between the lines; a yellowish stain about tornus, with a small dark patch and another before outer margin above middle. Hind wing whitish, stained with fuscous, especially at apex and inner angle. Expanse, 13 mm.

*Cotypes.*—Two males, No. 15798, U.S.N.M.; La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck).

**ANÆNE SQUALIDA, new species.**

As in *spurca*, but the gray shading is extensive, involving nearly the whole wing; a whitish space at base below a longitudinal basal dash; lines white, narrow, not attaining costa; dark marks on inner margin and before outer margin olivaceous, not as distinct as in *spurca*. Hind wing fuscous. Expanse, 13 mm.

*Type.*—Male, No. 15799, U.S.N.M.; Porto Bello, May, 1912, (Busck).

**ANÆNE IMPROSPERA, new species.**

Fore wing wood-brown, with numerous fine straight oblique dark brown lines subparallel to outer margin; a large elongate dark discal mark; costa coppery brown with fine white oblique streaks in reversed direction to the lines, and small patch before apex; margin narrowly dark brown, fringe lighter brown. Hind wing fuscous brown, fringe light brown. Expanse, 10 mm.

*Cotypes.*—Two males, No. 15800, U.S.N.M.; Tobago Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**ANÆNE DIAGRAMMA, new species.**

Palpi with the third joint long; fore wing with outer margin square, a little incised below apex. Fore wing gray, the central veins lighter, yellowish scaled, the whole wing minutely transversly lined with alternating light and dark scales; two brown-black lines across the wing, the inner curved, the outer a little waved broadly below; three dots on costa before apex and a row of irregular subconfluent marginal ones. Hind wing dark fuscous. Expanse, 10 mm.

*Cotypes.*—Four males, one female, No. 15801, U.S.N.M.; Tobago Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

## DIXANÆNE, new genus.

With the characters of *Anæne*, but veins 3 and 4 of fore wing stalked; the palpi have the third joint long; fore wing not subfalcate, apex roundedly pointed, outer margin oblique.

*Type of the genus.—Dixanæne lepidocæna,* new species.

**DIXANÆNE LEPIDOCÆNA, new species.**

Fore wing light gray, the scales arranged in minute transverse whitish and dark brown lines, some 50 of each color, the ground nearly pure white in patches at base above, on inner margin at basal third and in a wavy subterminal line; patches of long spatulate scales, black on white, in three areas, one subbasal, one medial, one subterminal, none attaining costa; inner line coppery brown, from costa to median vein; outer similar, crossing wing, gently excurved above and below; a row of terminal black dashes. Hind wing whitish, fuscous tinted outwardly, with dark terminal line. Expanse, 11 mm.

*Cotypes.*—Four males, two females, No. 15802, U.S.N.M., Tobaga Island, February, 1912 (Busck); Porto Bello, April, 1912 (Busck); La Chorrera, May 1912 (Busck).

## SAOZANA, new genus.

Differs from *Odozana* Walker in having vein 11 of fore wing free, not anastomosing with 12 and veins 6 and 7 of hind wing coincident. The hind wings of the male are greatly expanded in the anal area, with a notch above vein 2.

*Type of the genus.—Odozana leucota* Hampson.

**SAOZANA LEUCOTA Hampson.**

1. Trinidad River, March, 1912.

White; fore wing irrorated with pale fuscous patches. The male has numerous secondary sexual characters: On fore wing a pencil of stiff black hairs on under side running along inner margin and an elliptical thick glandular fovea below the cell; on hind wing the remarkable expansion of anal area and a thick fovea at the end of the cell.

## Family ARCTIIDÆ.

**IDALUS HIPPIA Stoll.**

1. Trinidad River, June, 1912 (Busck).

**MELESE LAODAMIA Druce.**

1. Trinidad River, March, 1912 (Busck).

**MELESE INCERTA Walker.**

4. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**MELESE ASANA Druce.**

1. Trinidad River, March, 1912 (Busck).

**OCHRODOTA PRONAPIDES Druce.**

1. Porto Bello, March, 1911 (Busck).

**AMMALO INSULATA Walker.**

2. Corozal, Canal Zone, March, 1911 (Busck); Paraiso, Canal Zone, June, 1911 (Busck).

**HALISIDOTA RHOMBOIDEA Sepp.**

2. Porto Bello, February, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**HALISIDOTA CATENULATA Hübner.**

1. Trinidad River, March, 1912 (Busck).

**NEZULA GRISEA Schaus.**

1. Porto Bello, February, 1911 (Busck).

**PAREVIA PARNELLI Schaus.**

1. Cabima, May, 1911.

A female differing from the male type in having the hind wing crimson at base and the terminal gray border broad.

**AGORÆA MINUTA Schaus.**

9. Trinidad River, March and June, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**VIRBIA ROSENBERGI Rothschild.**

42. Porto Bello, March, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck); Trinidad River, March, 1912 (Busck); Paraiso, Canal Zone, February, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**VIRBIA OROLA, new species.**

Fore wing brown-black above; below with a large yellow patch over two-thirds of wing from base, except costa. Hind wing black with yellow patch on upper half of wing except margin; a yellow streak beneath at inner margin; neck with crimson ring; abdomen black above, gray below, without orange stripe. Expanse, 25 mm.

*Type.*—Male, No. 15810, U.S.N.M.; Porto Bello, April, 1912 (Busck).

**NERITOS COTES Druce.**

2. Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**APANTESIS PROXIMA Guerin.**

6. Porto Bello, March, 1912 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**ECPANTHERIA LAETA Walker.**

1. Porto Bello, April, 1911 (Busck).

**UTETHEISA VENUSTA Dalman.**

5. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Paraiso, Canal Zone, June, 1911 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

## Family HYPSIDÆ.

**LAURON SORA Boisduval.**

3. Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**HYALURGA SUBNORMALIS, new species.**

White; head and thorax stained with gray; two white dots on vertex and two on tegulæ; patagia with orange spot at base; abdomen with a dorsal and a subdorsal dark line. Wings white; veins dark on both pair; fore wing with the costa gray, stained with orange at base and subapically; a clouded dark spot at end of cell joined to costa and another above tornus between veins 2 and 3. Expanse, 39 mm.

*Type.*—Female, No. 15811, U.S.N.M.; Paraiso, Canal Zone, January, 1911 (Busck).

**PERICOPIS MARGINALIS Walker.**

3. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**PERICOPIS ANGULOSA IRENIDES Butler.**

2. Taboga Island, June, 1911 (Busck).

Mr. Busck took a pair, the male marked like normal *angulosa* Walker, except that the lower part of the central band is yellow, the female of a form like *ithomia* Felder. The species is not *ithomia*, which I identify in three specimens from Costa Rica agreeing with Felder's figure, but so much like it that five specimens in the collection are so named. The present form, *irenides*, has a tendency to obsolescence of the basal red markings of fore wings in both sexes; of 12 before me from Panama only four have the red well developed. In two others it is reduced and in the remaining six entirely absent.

Mr. Busck made the following note about the defensive secretion of this species: "On capture these butterflies, male and female, emit through a slit in the thorax between the first and second thoracic segments a profuse, ochery yellow, staining foam, three to four inches of it at a time by a half inch in diameter. No smell perceptible."

I have noticed a similar habit in *Composia fidelissima* Herrich-Schäffer.[1]

**GARDINIA MAGNIFICA Walker.**

4. Porto Bello, February, 1911 (Busck).

## Family AGARISTIDÆ.

**EUSCHIRROPTERUS POEYI PULVEROSA, new subspecies.**

Differs from *poeyi* Grote in the absence of a sharp line on submedian separating the white and dark areas; the line is present only on the part of the dark border beyond the origin of vein 2; white space of fore wing rather broader, the discal dot less elongated, not crossing the white space; the orbicular large, rounded and with a powdery light center like the reniform. Male without the dark marginal border to the hind wing, the subanal yellow spot edged by a few dark scales. Expanse, 33–36 mm.

*Cotypes.*—One male, six females, No. 15812 U.S.N.M.; La Chorrera, May, 1912 (Busck).

**DIAMUNA FALCATA Druce.**

1. Trinidad River, March, 1912 (Busck).

## Family NOCTUIDÆ.

### Subfamily AGROTINÆ.

**AGROTIS REPLETA Walker.**

1. Porto Bello, February, 1911 (Busck).

**LYCOPHOTIA INFECTA Ochsenheimer.**

8. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, March, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck); Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**LYCOPHOTIA RODEA Schaus.**

2. Taboga Island, June, 1911 (Busck).

**EUXOA AGRESTIS Grote.**

1. La Chorrera, May, 1912 (Busck).

The specimen is typical, but I feel that confirmation of this occurrence should be had before being considered authentic, as the specimen may have been wrongly labeled by the preparator.

### Subfamily HADENINÆ.

**XANTHOPASTIS TIMAIS Cramer.**

1. La Chorrera, May, 1912 (Busck).

**CIRPHIS HUMIDICOLA Guenée.**

4. Cabima, May, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek).

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[1] Entomological News, vol. 2, 1891, p. 50.

**CIRPHIS MULTILINEA Walker.**

1. La Chorrera, May,1912 (Busck).

**CIRPHIS STRIGUSCULA Dyar.**

1. Corozal, Canal Zone, March, 1911 (Busck).

**CIRPHIS LATIUSCULA Herrich-Schäffer.**

5. Porto Bello, February, 1911 (Busck); Paraiso, Canal Zone, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**CIRPHIS INCONSPICUA Herrich-Schäffer.**

1. La Chorrera, May, 1912 (Busck).

**CIRPHIS UNIPUNCTA Haworth.**

1. Porto Bello, February, 1911 (Busck).

**CIRPHIS MICROSTICTA Hampson.**

1. Corozal, Canal Zone, March, 1911 (Busck).

**CIRPHIS SETECI, new species.**

Near *cinereicollis* Walker, but the dark longitudinal shade paler gray, not black, the white mark at end of cell small and joined to base by narrow obscure whitish line along median vein; markings light and fine; outer row of dots faint; pale-colored throughout and not contrasted as in *cinereicollis*. Expanse, 28–31 mm.

*Cotypes.*—Two males, three females, No. 15834, U.S.N.M.; Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

## Subfamily ACRONYCTINÆ.

**CROPIA DIMORPHA, new species.**

*Male.*—Dark brown; a brown-black triangular patch on costa, touching the large full pale reniform, which is narrowly ringed with black and concentrically marked; a double black and brown line across apex to vein 5, where it runs to margin, the apex deeper purplish; ordinary lines indistinct, wavy; orbicular a minute black ring. Hind wing solidly dark brown. Expanse, 38–40 mm.

*Female.*—Lilacine gray, all the marks obliterate except the costal triangle and dark apex, which is contrastingly dark. Hind wing dark fuscous. Expanse, 35–38 mm.

*Cotypes.*—Two males, two females, No. 15837, U.S.N.M.; Colombia (W. E. Pratt); Cabima, Panama, May, 1911 (Busck).

Differs from *Cropia* in having no tufts on the abdomen, but the condition of the vestiture is poor in all the specimens, esspecially upon the thorax, so that they can not be more definitely placed.

**SPEOCROPIA ÆNYRA Druce.**

1. Cabima, May, 1911 (Busck).

**SPEOCROPIA LEUCOSTICTA Hampson.**

1. Taboga Island, June, 1911 (Busck).

**SPEOCROPIA RANDA Schaus.**

2. La Chorrera, May, 1912 (Busck).

**PERIGEA MIMICA Hampson.**

2. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, May, 1911 (Busck).

**PERIGEA CUPENTIA Cramer.**

2. Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**PERIGEA ALBIDA Felder.**

1. Cabima, May, 1911 (Busck).

**PERIGEA SUTOR Guenée.**

14. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck); La Chorrera, May, 1912 (Busck); Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck); Corozal Canal Zone, July, 1912 (J. Zetek).

**PERIGEA ALBIGERA Guenée.**

2. Cabima, May, 1911 (Busck).

**PERIGEA LINEATA Druce.**

2. Cabima, May, 1911 (Busck).

**PHUPHENA TURA Druce.**

1. Cabima, May, 1911 (Busck).

**PRORACHIA DARIA Druce.**

1. La Chorrera, May, 1912 (Busck).

**ERIOPUS FLORIDENSIS Guenée.**

1. Porto Bello, February, 1911 (Busck).

**LAPHYGMA FRUGIPERDA Smith and Abbot.**

37. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February and March, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck); Corozal, Canal Zone, February, 1911 (Busck), July, 1912 (C. P. Crafts and J. Zetek).

Apparently more abundant than the number of specimens would indicate. Mr. Zetek labeled a specimen "166," presumably referring to notes. Mr. Crafts remarks: "Feeds on Guinea grass; in some localities it has stripped all the blades off of large areas. Picked 1,000 on 100 square feet (and left some) in an average spot on a ten-acre field."

**STRAUROPIDES PERSIMILIS Hampson.**

1. Taboga Island, February, 1912 (Busck).

**ACRORIA DIMINUTA Guenée.**

1. La Chorrera, May, 1912 (Busck).

**XYLOMYGES SUNIA Guenée.**

1. Trinidad River, June, 1912 (Busck).

**XYLOMYGES ERIDANIA Cramer.**

1. Trinidad River, May, 1912 (Busck).

**GONODES CUNEATA, new species.**

Near *G. liquida* Möschler, smaller, brown costal area confined to a small triangle not reaching below center of reniform and obliquely cut below; outer line strongly excurved, forming an obtuse angle, to which a broad streak runs from below apex, dislocated and continued to center of reniform. Expanse, 23 mm.

*Type.*—Female, No. 15852, U.S.N.M.; Cabima, May 1911 (Busck).

**GONODES DENSISSIMA, new species.**

Dark brown; fore wing with coppery tint, especially in terminal space and inner area; lines dark, obscure; a straight dark shade from apex to before tornus is most distinct; inner, medial and outer lines curved, slight, wavy; a waved and broken subterminal line near the margin, dark without, coppery within. Hind wing solidly black-brown. Expanse, 28 mm.

*Type.*—Female, No. 15838, U.S.N.M.; Trinidad River, March, 1912 (Busck).

The angulation on the outer margin is at vein 3 instead of 4 as usual in the genus; the palpi are obliquely ascending instead of sharply upturned; the eyes have long cilia from behind and below, none at all from the upper side or in front. The species does not fit well in *Gonodes*, or even in the subfamily Acronyctinæ, but vein 5 of hind wing is weak and arises from middle of discocellulars, so that it can not be placed in the Plusiinæ.

**MENOPSIMUS CRAMBIFORMIS, new species.**

Fore wing deep brown; inner line golden yellow, obscure, produced outward in an angle in cell; outer line far outward, with a sharp outer angle in upper third preceded in the angle by a patch of lilacine scales and followed by a broad band of these below; costa at apex white-streaked; termen pale, with two or three black streaks; a black line followed by dull golden before fringe; an oblique whitish mark for reniform, joining outer line. Hind wing fuscous, lighter at base. Expanse, 12 mm.

*Type.*—No. 15840, U.S.N.M., selected from a series of 32; Trinidad River, May, 1911 (Busck); Paraiso, Canal Zone, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

Since preparing the above, I have examined the type of *Hypenodes dubia* Schaus and believe it to be the same species as *Menopsimus crambiformis.* The type of *dubia,* a female, is in such poor condition, rubbed and without palpi or legs, that I decide to let my new name stand, preferring a synonym to a possible misidentification.

**HYPENOPSIS MACULA Druce.**

14. Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (C. P. Crafts and J. Zetek); Trinidad River, March, 1912, and May, 1911 (Busck); Paraiso, Canal Zone, April and May, 1911 (Busck); Cabima, May, 1911 (Busck).

**MICRATHETIS TRIPLEX** Walker.

8. La Chorrera, May, 1912 (Busck).

**MICRATHETIS DACULA** Dyar.

9. Taboga Island, February, 1912 (Busck); Porto Bello, February, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

The specimens agree with the types of *dacula* from French Guiana, except that the brown shading within the outer line is less extensive. This is apparently a distinct species and not a race of *M. dasarada* Druce.

**MICRATHETIS TECNION,** new species.

Somewhat smaller than *dacula* and more sharply marked; middle line not so strongly oblique, bent a little at the black punctiform reniform, preceded by a slight brown shade; subterminal line oblique from apex, where it is marked by a black dash; terminal series of minute points. Hind wing pale, with slight yellowish tint, paler than in *dacula,* not so white as in *dasarada.* Expanse, 13 mm.

*Cotypes.*—Six males, two females, Cat. No. 15841, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

Resembles *dasarada,* smaller, broader-winged, the marks more upright, discal dot minute, but distinct.

**MONODES DEVARA** Druce.

2. La Chorrera, May, 1912 (Busck).

**MONODES BARBAROSSA** Hampson.

1. La Chorrera, May, 1912 (Busck).

A male, apparently referable here.

**MONODES AGYRA** Druce.

1. Cabima, May, 1911 (Busck).

**MONODES LANGIA** Druce.

1. Trinidad River, March, 1912 (Busck).

The abdomen has no basal crest.

**MONODES HYPOSCOTA** Hampson.

1. La Chorrera, May, 1912 (Busck).

**MONODES MICROMMA,** new species.

Two very small females with dark hind wings, specifically separable from *costagna* (Schaus), of which I have the male type from Brazil. There is a difference of ornamentation. In *costagna* there is a long ocher streak on vein 3. In the present form there is an ocher spot between veins 2 and 3, no streak.

*Cotype.*—Two females, No. 15921, U. S. N. M.; Cabima, May, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck).

**MONODES DELTOIDES** Möschler.

1. Trinidad River, March, 1912 (Busck).

**MONODES AGROTINA Guenée.**

31. Porto Bello, March, 1912 (Busck); La Chorrera, May, 1912 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**MONODES NIVEIPLAGA Schaus.**

2. La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**MONODES EXESA TROLIA, new subspecies.**

*M. exesa exesa* Guenée from Florida occurs also in Mexico, State of Vera Cruz [Misantla and Orizaba (Müller), Paso San Juan (Schaus)].

*M. exesa trolia* is a smaller, slighter form with narrower wings, the fore wing beneath clearer, without brown shades, the markings better relieved.

*Cotypes.*—One male, two females, No. 15842, Paraiso, Canal Zone, February, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**MONODES COMMACOSTA, new species.**

Costa broadly pale clayey yellow from base of inner margin to apex, where it is obliquely cut; rest of wing reddish brown, shading to purple on margin; median space with black streaks; a small white dot above vein 1; reniform lunate, fused in the costal band; outer line pale, narrow, upright; fringe dark. Hind wing whitish, without terminal dark shade. Expanse, 18 mm.

*Cotypes.*—Two males, No. 15843, U.S.N.M.; La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

Similar to *M. monyma* Druce, which is not before me, but apparently smaller and more distinctly marked.

**MONODES PERIGEANA Schaus.**

5. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Capima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

The specimens are all smaller than the male type from Costa Rica and the markings not quite so much obscured.

**MONODES LITHOTELA, new species.**

Fore wing blackish brown; lines formed by rows of white points; a long fusiform olive-ocher dash through the cell, separating two of the largest white dots of the outer line; an irregular broken olive subterminal shade. Hind wing black. Expanse, 17 mm.

*Type.*—Female, No. 15856, U.S.N.M.; Cabima, May, 1911 (Busck).

**MONODES IPSIDOMO, new species.**

Fore wing pale lilacine gray in ground; median area extending obliquely to apex brown-black, cut by a large pale whitish-washed patch on costa, in the lower part of which is the reniform, narrow, oblique, pale; basal area dark shaded, with a black dash below median vein; another dash in the dark area beyond reniform; subterminal line pale, excurved below. Hind wing dark fuscous to blackish. Expanse, 15–16 mm.

*Cotypes.*—Male and female, No. 15857, U.S.N.M., selected from a series of thirteen; Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, March, 1911, and June, 1912 (Busck), July, 1912 (J. Zetek).

**PHOBOLOSIA GRANDIMACULA** Schaus.

10. Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**PHOBOLOSIA MYDRONOTUM,** new species.

Fore wing light gray, minutely squamose in darker; a terminal row of black dots; a violaceous metallic area at tornus; a trace of same color centrally near inner margin. Hind wing similar, but the violaceous color much diffused. Abdomen dorsally metallic black and blue, with golden bars at bases of the central segments. Expanse, 10 mm.

*Type.*—Female, No. 15844, U.S.N.M.; Porto Bello, May, 1912 (Busck). Allied to *P. aurilinea* Schaus.

**OGDOCONTA PULVILINEA** Schaus.

24. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts and J. Zetek).

**LEUCOSIGMA RELETIVA,** new species.

Violaceous gray, without red tint; patch at apex square, pale; V-shaped marking joining orbicular and reniform dull yellow, as is also the patch at base. Hind wing fuscous. Expanse, 28 mm.

*Type.*—Female, No. 15839, U.S.N.M.; Trinidad River, March, 1912 (Busck).

The specimen is in poor condition, but obviously distinct from *L. uncifera* Druce.

**SACADODES PYRALIS** Dyar.

3. Taboga Island, February, 1912 (Busck); Trinidad River, March and June, 1912 (Busck).

**BAGISARA SUBUSTA** Hübner.

2. La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**BAGISARA AVANGAREZA** Schaus.

1. La Chorrera, May, 1912 (Busck).

**BAGISARA ANOTLA,** new species.

Buff-yellow, almost without markings; subterminal line most distinct, dark shaded, evenly curved; traces of outer line, which form a point beyond cell and of annular reniform; a slight darker shading near center of outer margin. Expanse, 27–29 mm.

*Cotypes.*—Male and female, No. 15846, U.S.N.M.; Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

This may be an immaculate form of *B. avangareza* Schaus.

**CHALCOECIA EMESSA** Druce.

1. Trinidad River, June, 1912 (Busck).

**CHALCOECIA HEOCHROA, new species.**

Allied to *C. emessa* Druce, but lighter colored and smaller. Hind wing pale straw color, shaded with reddish brown on margin. Fore wing paler than in *emessa*, the basal space rosy violet, the shading on inner half of median space olive brown; outer line excurved in the middle. Expanse, 27 mm.

*Cotypes.*—Two females, No. 15845, U.S.N.M.; Alhajuelo, April, 1911 (Busck). Also a male and two females from Aroa, Venezuela (Schaus collection).

**CLOSTEROMORPHA RUFIFACTA, new species.**

Similar to *C. reniplaga* Felder; the largo costal patch is brown-red, ending in black outwardly; the ground color is suffused with reddish; the lines are faint, the outer bent at an obtuse angle; the discal marks small, faintly pale ringed. Expanse, 30 mm.

*Cotypes.*—Two females, No. 15858, U.S.N.M.; Trinidad River, March and June, 1912 (Busck).

A male of this form is before me from Omai, British Guiana (W. Schaus).

Since preparing this description, a female from St. Jean, French Guiana, has been sent to the Museum by Mr. Schaus, labeled "*C. cupreiplaga* Hamps.," a manuscript name at the time but lately published.[1]

**AMOLITA SENTALIS Kaye.**

30. Porto Bello, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March and April, 1911 (Busck); La Chorrera, April, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

This is a very small species. The North American *A. obliqua* Smith is very similar in markings, but of twice the size and I believe a distinct species, not a synonym of *sentalis*. In *obliqua* a faint longitudinal band runs below the cell and joins the inner of the two lines. This is only slightly indicated in *sentalis*.

**AMOLITA PEPITA, new species.**[2]

A medium-sized species, marked as in *sentalis* Kaye. The inner of the two lines is distinct and broad, black next the apex, partly reddish below, traversing the wing. No trace of longitudinal line. Outer discal dot enlarged or doubled, black. Expanse, 19–23 mm.

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[1] Ann. Mag. Nat. Hist. (8), vol. 13, 1914, p. 160.

[2] Three other forms in the collection have been confused, and may be characterized as follows:

**AMOLITA SOLITARIA, new species.**

Like *A. obliqua* Smith, but the inner line as it turns to run below the cell is bent at a rather sharp angle and becomes attenuated, not running broadly and evenly as in *obliqua*. The wings are less pointed at apex than in *obliqua*. Expanse, 21 mm.

*Type.*—Female, No. 15848, U.S.N.M.; Demerara, British Guiana (Schaus collection).

**AMOLITA INTENSA, new species.**

Lines traversing the wing, the inner broad, diffused, shaded with red; outer slender, sometimes obsolete. Wing somewhat longitudinally shaded; not irrorate; discal dots punctiform, single. Hind wing pale straw color. Expanse, 23-26 mm.

*Cotypes.*—One male, three females, No. 15849, U.S.N.M.; Castro, Parana, Brazil (Schaus collection).

**AMOLITA PARANOMA, new species.**

Pale straw color; fore wing heavily irrorated in the female, scarcely at all so in the male; lines slender, powdery, oblique, parallel, both crossing the wing; a brown line on median vein and its branches; discal dots small, distinct, black, the outer usually doubled. Hind wing whitish, with straw-color tint. Small terminal dots on both wings. Expanse, 24-30 mm.

*Cotypes.*—Two males, three females, No. 15850, U.S.N.M.; Castro, Parana, Brazil (Schaus collection).

*Cotypes.*—Male and female, No. 15847, selected from a series of 38; Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1911 (Busck); Trinidad River, March and June, 1912 (Busck); Cabima, May, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); La Chorrera, May, 1912 (Busck).

### ABLITA, new genus.

Proboscis aborted, small; palpi obliquely upturned, second joint fringed with hair below, third moderate, smooth; frons smooth, without hair-tuft; eyes large, round; thorax clothed chiefly with scales, without crests; tibiæ smoothly scaled; abdomen without crests; fore wing narrow, apex square, veins 7–10 stalked, or, abnormally, 10 anastomosing shortly with stalk of 7–9 to form a very small accessory cell. Hind wing with veins 3–4 shortly stalked, 5 obsolescent from angle of discocellulars, 6–7 stalked; 8 anastomosing with cell near base..

*Type of the genus.*—*Neolita adin* Schaus.[1]

**ABLITA ADIN Schaus.**

1. La Chorrera, May, 1912 (Busck).

The specimen does not agree very closely with the type of *adin*, but is in poor condition and I can not positively separate it.

**ABLITA NYMPHICA, new species.**

Vertex of head nearly white; palpi upturned, the second joint reaching vertex, brown scaled, white tipped, third joint slender, brown banded. Fore wing purplish ochraceous, irrorated with dark brown; costa dark at base; inceptions of inner and mesial lines on costa shown as short streaks; shorter streaks toward apex; a small black discal dot. Hind wing whitish, with dark terminal marks.

*Cotypes.*—Two females, No. 15853, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Also three males and a female with the discal dots fused into a round spot, tentatively placed here; La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); July, 1912 (C. P. Crafts).

**ABLITA GRAMMALOGICA, new species.**

Palpi obliquely porrect, second joint fringed with scales at summit, third smoothly scaled, without dark scales. Fore wing straw color, shaded obscurely with olive brown, forming streaks toward apex and outwardly; subbasal line slender, brown, dentate, reaching submedian fold; inner line oblique, to submedian, incurved thence to vein 1; median line shaded, obscure, excurved to reniform; outer line starting in an oblique dash on costa, excurved over cell; short black streaks on costa before apex; marginal spots brown, lunate, nearly touching; discal mark small, white, incompletely edged by black scales. Hind wing sordid whitish, tinged with brown; marginal brown marks nearly confluent. Expanse, 17 mm.

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[1] *Neolita adin* Schaus, Ann. Mag. Nat. Hist. (8), vol. 8, 1911, p. 107.

*Type.*—Female, No. 15854, U.S.N.M.; Porto Bello, April, 1912 (Busck).

**DANTONA CORVES, new species.**

Fore wing gray-brown, more or less heavily shaded with gray-black; outer line a row of black spots from before apex to outer third of inner margin, forming a line below; discal dot double, white, black-edged and joined to a black bar in cell; slight black bar also on submedian at base; terminal area somewhat streaked, the pale ground persisting in elongate patches between the veins; a row of terminal black dots. Hind wing soiled white in the male, densely fuscous powdered in the female. Expanse, 22 mm.

*Cotypes.*—Two males, one female, No. 15855, U.S.N.M.; Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**EUDRYAS SANCTÆ-JOHANNIS Walker.**

1. La Chorrera, May, 1912 (Busck).

**AUCULA BUPRASIA Druce.**

1. La Chorrera, May, 1912 (Busck).

**AUCULA PARTICOLOR, new species.**

Fore wing black, shading to deep red at apex, densely irrorated with blue; the irrorations define a median black line, angled outwardly in the middle, and an outer oblique line close to it, excurved over cell, the two inclosing above a large annular reniform; a subterminal macular band; all the markings entirely of the ground color and defined by the pale irrorations. Hind wing with a large elliptical orange patch at base. Beneath, fore wing with a large transverse orange spot outwardly. Expanse, 27–29 mm.

*Cotypes.*—Two males, one female, No. 15851, U.S.N.M.; La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

Allied to *A. sublata* Walker. The antennæ of the male are simple.

**VESPOLA PLUMIPES Schaus.**

1. Chiriquicito (W. Schaus).

### Subfamily ERASTRIINÆ.

**ARÆOPTERA BETIE, new species.**

Palpi small, with the front black; tongue yellow. Fore wing with outer margin rounded, pointed at apex and middle; white, with scattered brown scales; discal dot and a half band before tornus dark brown. Hind wing with apical projection, white, with a mesial band and two more close to the margin of diffused chocolate-brown scales. Expanse, 10 mm.

*Cotypes.*—Two females, No. 15866, U.S.N.M.; Corozal, Canal Zone, April, 1911 (Busck); Trinidad River, March, 1912 (Busck).

Allied to *A. elam* Schaus, described in *Acidaliodes*, but having vein 7 of fore wing stalked, and therefore an *Aræoptera.*

**ACIDALIODES ENONA Druce.**

7. Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); Porto Bello, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**ACIDALIODES MELA, new species.**

Palpi rather short and shaggy in front, with the front black; tongue yellow. Fore wing with veins 4 and 5 stalked, narrow, entire, apex pointed; gray, the costa black, with three interruptions; an elongate black discal mark and row of terminal dots; three red dots for inner line; four outer faint brownish transverse lines of scales, more or less complete. Hind wing with a subbasal black line; a brown line beyond the middle and two close to margin. Basal segment of abdomen black, the rest gray. Expanse, 9 mm.

*Type.*—Male, No. 15865, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**ACIDALIODES UMBER, new species.**

Thorax light brown, the scales white-tipped. Fore wing excavate below apex, brown, the scales white-tipped except over disk; marks nearly obsolete; some dark central streaks and blackish dots, indistinctly connected by luteous in positions of the ordinary lines; a row of terminal black dashes, preceded by a white line; fringe with black scales at apex and center of margin. Hind wing with broken row of black scales beyond base, middle orange shaded band, two blackish lines in outer field where the scales are gray-tipped and terminal white line. Expanse, 10 mm.

*Type.*—Male, No. 15860, U.S.N.M.; Trinidad River, May, 1911 (Busck).

Allied to *A. truncata* Hampson.

**ACIDALIODES FLAVIPARS, new species.**

Body shaded with purple dorsally. Fore wing narrow, long, broadly purple gray on costal half, with undulating lower edge; inner area pale yellow, with orange scales next the purple. Hind wing small, pale yellow, narrowly purple at base, followed by red and orange irrorations outwardly. Anal tuft pale yellow, preceded by red. Expanse, 11 mm.

*Type.*—Male, No. 15861, U.S.N.M.; Alhajuelo, April, 1911 (Busck).

Allied to *A. enona* Druce.

### DYMBA, new genus.

Palpi upturned, second joint expanded with scales slightly at tip, third moderate, smooth; tongue moderate; front smooth, without prominence; vestiture without crests, scaly. Fore wing with vein 3 from angle of cell, 4–5 stalked, 6 below upper angle of cell, 7–10 stalked, 7 before 10, 11 free, oblique. Hind wing with 3–4 stalked, 5 from near center of cross vein, 6–7 stalked, 8 anastomosing with cell near base only.

*Type of the genus.*—*Dymba coryphata*, new species.

**DYMBA CORYPHATA, new species.**

Front dark brown, with a black point on each side: vertex lilac gray, with central black point, thorax lilac gray, brown-black behind; abdomen white, with dorsal row of black specks. Fore wing elongate, apex pointed, outer margin oblique; ground white, but showing only centrally and at apex; base dark purple, with subbasal half band and inner band of dark brown; median space irrorate with brown and black, leaving a white patch in cell with oblique black line beyond it and another on inner margin outwardly; outer line indicated by a black band from costa in dense irrorations, which cease outwardly, leaving the apex broadly white; a row of terminal black dots; fringe tipped with grayish. Hind wing white with scattered black scales, forming broken subbasal, mesial, outer and submarginal lines; some black scales on termen at apex; fringe grayish. Expanse, 11 mm.

*Type.*—Male, No. 15909, U.S.N.M.; Trinidad River, March, 1911 (Busck).

**PSEUDOCRASPEDIA LEUCOZONA Hampson.**

1. Porto Bello, April, 1912 (Busck).

**PSEUDOCRASPEDIA SODIS, new species.**

Palpi slender, small, somewhat shaggy in front, with the front black. Fore wing produced at apex and middle; grayish white with spots of black scales along the costa; an outer curved white band, a shade lighter than the ground; an oblique half band of brown scales before tornus. Hind wing pointed subapically and at middle; grayish white; base and two closely following bands to one-third of wing gray; margin broadly gray shaded, leaving a slender white line at outer fourth, pointed in the middle and forming two broad arcs; another line just before the narrow dark termen. Expanse, 11 mm.

*Cotypes.*—Three females, No. 15869, U.S.N.M.; Trinidad River, March and June, 1912 (Busck).

**PSEUDOCRASPEDIA HOLOPOLIA, new species.**

Dark gray; fore wing with straight oblique central line and more slender outer one, slightly divergent toward costa; a shaded submarginal line, slightly bent and thickened below. Hind wing with straight central brown line, fine wavy outer one, followed by a faint straight line and broad dark marginal one. Expanse, 10 mm.

*Type.*—Female, No. 15876, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**PSEUDOCRASPEDIA MATHETES, new species.**

Light gray; fore wing with narrow straight oblique mesial line and dark brown blotches forming an irregular band close to margin.

Hind wing with a straight mesial line, the base only slightly darker than the central area; three dark outward lines close together, first narrow, other two broad, the last close to margin; outer margin straight, but not excavated as in *sodis*. Expanse, 10 mm.

*Cotypes*.—Two specimens, No. 15867, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**LYCAUGESIA FUSCICOSTA Hampson.**

4. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**LYCAUGESIA MELASOMA Hampson.**

1. La Chorrera, May, 1912 (Busck).

**LYCAUGESIA HYPOZONATA Hampson.**

10. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**LYCAUGESIA INFANTILIS Schaus.**

2. Porto Bello, April, 1912 (Busck): Trinidad River, June, 1912 (Busck).

**LYCAUGESIA SEMICLARA, new species.**

Fore wing pointed at apex; straw color, irrorated with brownish on the costal half; discal mark round, purplish, joined to apex by a faint streak; a line of brownish shading before outer margin. Hind wing straw color at base, crossed by a line of red scales; outer two-thirds lilacine gray, shaded with dark irrorations in lines. Fore wing below with longitudinal dark shade in cell. Expanse, 12 mm.

*Type*.—Female, No. 15881, U.S.N.M.; La Chorrera, May, 1912 (Busck).

Allied to *L. homogramma* Schaus.

**LYCAUGESIA MICROZALE, new species.**

Reddish brown; costal third of fore wing dark gray, irrorated with darker; discal dot black, distinct; some dark dots near base on edge of costal shade. Hind wing darker brown, with fine wavy lines of red scales; a black dot at apex and one on inner margin; a black streak on inner half of outer margin. Expanse, 10 mm.

*Type*.—Female, No. 15582, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**LYCAUGESIA CALOCHROIA, new species.**

Fore wing yellow, irrorated with orange; a clouded rosy purple discal patch, with dark purple dot; a faint purplish patch at base of costa. Hind wing with a broad rosy purple curved central band, its edges marked by lines of blackish scales. Expanse, 11 mm.

*Cotypes*.—Four specimens, No. 15883, U.S.N.M.; Porto Bello, April, 1912 (Busck); Trinidad River, March, 1912 (Busck).

**LYCAUGESIA EPISTIGMA, new species.**

Fore wing carneous gray, with red dots at base and for inner line; a large black discal spot; a row of minute terminal dots. Hind wing with wavy lines of red scales, forming faint bands; terminal dots as on fore wing. Thorax with red dots and one on vertex of head. Expanse, 9 mm.

*Type.*—Female, No. 15884, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**LYCAUGESIA STIGMALEUCA, new species.**

Pale gray, luteous over disk of fore wing; lines slender, faint, bent, oblique on costa; apex dark shaded and longitudinally streaked; discal spot distinct, white. Hind wing with two mesial rufous lines, filled with gray and followed by a white line; terminal line black. Below fore wing shaded gray broadly on costa. Expanse, 12 mm.

*Type.*—Male, No. 15877, U.S.N.M.; Trinidad River, June, 1912 (Busck).

**LYCAUGESIA PSEUDURA, new species.**

Fore wing light brown, markings purplish, light, not contrasted; a dark patch at base; inner line very faint; outer slender, dark, followed by a lighter area, strongly excurved in the middle; dark spotting at apex; a terminal row of small dots. Hind wing faintly lined with fulvous; a purplish half band on inner margin and patch on lower half of margin, forming a spot in the fringe centrally like a projection. Expanse, 12 mm.

*Type.*—Male, No. 15874, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Near *L. hypozonata* Hampson in shape and general color.

**LYCAUGESIA GRATIFICULA, new species.**

Fore wing long and narrow, pale yellow, shaded faintly with purplish along the costa and outer margin; a darker discal patch and faint angled white outer line. Hind wing with pale yellow band before middle; base and subterminal area pale purplish; terminal area pale red-brown. Expanse, 10 mm.

*Cotypes.*—Two females, No. 15875, U.S.N.M.; Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

Allied to *L. teneralis* Walker.

**LYCAUGESIA POSTNIGRESCENS, new species.**

Fore wing light violaceous brown, with a few dots and streaks representing the usual lines; a subapical black streak is most prominent. Hind wing heavily shaded with dark over ground color like that of fore wing, in irregular blotches, leaving the base, a patch on inner margin, and one on outer margin pale; terminal dots on both wings. Expanse, 15 mm.

*Type.*—Female, No. 15878, U.S.N.M.; Trinidad River, June, 1912 (Busck).

**LYCAUGESIA PERPURPURA, new species.**

Rich rosy purple; fringes of both wings ocher; fore wing with dark discal spot and zigzag white subterminal line; terminal row of dark spots. Hind wing with two well-separated curved dark purple lines; terminal dots more distinct than on fore wing. Below, dark fuscous. Expanse, 13 mm.

*Type.*—Female, No. 15879, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**LYCAUGESIA HEMIPENNIS, new species.**

Fore wing long and narrow; dark gray; inner line relieved by whitish on lower half; a narrow white upright discal dash with wavy white line below it to margin; subterminal zigzag white line; no terminal dots. Hind wing small, pale yellow. Fringes of both wings long, whitish. Below, fore wing gray, hind wing white. Expanse, 11 mm.

*Type.*—Female, No. 15880, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**LYCAUGESIA SEMIBLANDA, new species.**

Close to *L. gratificula* Dyar, differing chiefly in the presence of a broad gray costal shade on fore wing, similar to the shade on outer margin, half inclosing the discal dot. Expanse, 12 mm.

*Type.*—Female, No. 16029, U.S.N.M.; Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**LYCAUGESIA MONOSTELLA, new species.**

Grayish purple; fore wing with a yellow patch on basal third of inner margin, a large yellow discal mark and trace of a similar mark subterminally, all the yellow irrorated with red; indistinct black dots along costa and toward base of wing, representing the inner line. Hind wing with a small yellow and red discal dot, a fairly distinct blackish mesial line touching it, and scattered black specks beyond representing the outer line. Expanse, 11 mm.

*Type.*—Female No. 16030, U.S.N.M.; Trinidad River March, 1912 (Busck).

**ORUZA LEUCOCRASPIS Hampson.**

2. Taboga Island, February, 1912 (Busck); La Chorrera, May, 1912 (Busck).

### ARÆOPTERELLA, new genus.

Venation of *Aræoptera* Hampson except that vein 11 arises from the cell; palpi upturned, the third joint reaching about to vertex of head, continuously scaled with the second joint; front smooth; eyes large; tongue well developed; thorax clothed with scales, without crests; abdomen without crests.

*Type of the genus.—Aræopterella miscidisce,* new species.

**ARÆOPTERELLA MISCIDISCE, new species.**

Front and palpi black; vertex, thorax, and abdomen and fore wing pale gray. Fore wing more whitish toward costa, shaded with olivaceous gray outwardly, relieving a white subterminal band and white dots before the small black terminal ones; ordinary lines obsolete; a black dot at middle of costa; a white shade for outer line, regularly curved. Hind wing with light-brown shading beyond the middle, relieving a diffuse white discal patch; mesial and outer lines of white scales; termen as on fore wing, without the black dots; fringe concolorous. Expanse, 16 mm.

*Type.*—Female, No. 16031, U.S.N.M.; Trinidad River, June, 1913 (Busck).

**EUBLEMMA CINNAMOMEA Herrich-Schäffer.**

8. Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

## CHAROBLEMMA, new genus.

Fore wing with veins 8–10 stalked; frons without prominence; abdomen without crests; proboscis well developed; palpi oblique, the second joint fringed above with hair toward extremity; hind wing with vein 8 anastomosing with the cell near base, veins 3–4 stalked, 5 well below angle of discocellulars.

*Type of the genus.*—*Charoblemma unilinea*, new species.

**CHAROBLEMMA UNILINEA, new species.**

Fore wing straw-color; a broad, oblique brown-black band from apex to basal third of inner margin, the space beyond it carneous shaded; margin brown-black. Beneath the shade is repeated, and there is another in the cell, as described for *Eublemma flavia* by Hampson. Hind wing straw-color, carneous tinted toward the margin. Expanse, 12 mm.

*Type.*—Female, No. 15864, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**CHAROBLEMMA OPISTHOMELA, new species.**

Straw color; fore wing with slight purplish tint and an oblique line of black dots nearly coincident with a dull olivaceous band from beyond middle of inner margin to costa before apex. Hind wing pale stramineous. A black patch on posterior part of thorax. Expanse, 11 mm.

*Type.*—Male, No. 15868, U.S.N.M.; Taboga Island, February, 1912 (Busck).

**ANABLEMMA LEBANA Schaus.**

3. Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**ANABLEMMA ZIHA Schaus.**

1. Cabima, May, 1911 (Busck).

**ANABLEMMA PALLIOLA, new species.**

Fore wing pointed subapically; brownish straw color, the costa and margin marked with a few dark scales and a small spot on inner margin at outer fifth; markings obsolete, represented by a few undefined scales. Hind wing yellowish, with central dark discal spot. Expanse, 14 mm.

*Type.*—Male, No. 15870, U.S.N.M.; La Chorrera, May, 1912 (Busck).

Allied to *A. ziha* Schaus.

**PROROBLEMMA PHILOGONIA, new species.**

Fore wing pointed at apex, projecting at middle of outer margin and prominently angled at middle of inner margin, especially in males, which have also a tuft of yellow scales on inner margin of hind wing. Straw color in male, rosy in female, densely, finely irrorated with gray, leaving a white outer line prominently excurved below costa; two minute black dots in cell; fringe dark brown. Hind wing yellowish in the male, fuscous tinted in female, with minute terminal dots. Expanse, 15–16 mm.

*Cotypes.*—Five males, 2 females, No. 15871, U.S.N.M.; Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

Allied to *P. rosea* Schaus.

**PROROBLEMMA CUPREISPILA, new species.**

Fore wing broadly triangular, outer margin evenly convex; top of head white; fore wing purplish, shading to coppery red about tornus, finely irrorated; a curved faint dark outer line and minute discal mark. Hind wing fuscous shaded, with traces of mesial band and discal dot, more distinct below. Expanse, 14 mm.

*Type.*—Female, No. 15872, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**PROROBLEMMA PORPHYREA, new species.**

Fore wing brilliant purple, a darker brown clouding on costa about outer line; outer line dark, excurved below costa; discal dot round, dark; a row of terminal black dots; fringe brown. Hind wing fuscous with terminal dots. Expanse, 13 mm.

*Type.*—Female, No. 15873, U.S.N.M.; Cabima, May, 1911 (Busck).

**MICROBLEMMA DISCIPUNCTA Hampson.**

3. La Chorrera, May, 1912 (Busck).

The specimens are females, agreeing well with Hampson's description and figure.

**MICROBLEMMA ULOPUS, new species.**

Fore wing yellowish brown, irrorated with fuscous, more densely on margin; a large round brown discal spot; costa dark brown, as also terminal dots and traces of inner and curved outer bands; a brown mark at base of inner margin. Hind wing fuscous, lighter on disk. Hind legs with the tarsi shorter than the tibiæ, with a long, dense fringe of scales on the upper side of tibia and all but last two tarsal joints, dark brown, crested with white on first two joints of tarsi. Expanse, 12 mm.

*Cotypes.*—Two males, No. 15904, U.S.N.M.; Cabima. May, 1911 (Busck).

This is possibly the male of *M. discipuncta* Hampson; fuller material will be needed to decide.

### GELENIPSA, new genus.

Frons smooth; tongue obsolete; palpi slender, smooth, oblique, not reaching vertex; antennæ of male with long slender pectinations; fore wing short and broad, costa arched, cell long, veins 4–5 from a point, 7–10 stalked, 9 absent, 11 from cell; hind wing with 3, 4 separate, 5 from middle of discocellulars.

*Type of the genus.*—*Gelenipsa psychodidarum*, new species.

**GELENIPSA PSYCHODIDARUM, new species.**

Vertex and collar nearly white; disk of thorax dark brown. Fore wing gray, irrorated with brown and black; a patch of coppery red scales on outer margin; lower median space broadly red-brown, defined by a dentate subterminal line, beyond which is an area of glaucous green with two black patches centrally next the coppery patch; toward base a patch of green on costa and on internal margin, followed by a black shade on costa, the base itself dark brown. Hind wing of the male fuscous shaded, darker on the margin; in the female all dark fuscous. Expanse, 10 mm.

*Cotypes.*—Five males, one female, No. 15905, U.S.N.M.; Trinidad River, March and June, 1912 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**PARANGITIA SUBRUFESCENS Kaye.**

1. La Chorrera, May, 1912.

**PARANGITIA CIRCUMCINCTA, new species.**

Hind wing of the male with modified discal and submedian folds as in *Angitia tiresias* Druce. Body ocher brown. Fore wing olivaceous brown, the inner line broad, black, curved, joining the outer along inner margin, which is curved, slightly denticulate and doubled outwardly by a narrow line; reniform, claviform, and orbicular similar, pale, gray-outlined, not contrasted; subterminal area narrowly gray with black shading. Hind wing black-brown, with a dash above tornus. Submedian fold whitish. Expanse, 28 mm.

*Type.*—Male, No. 15859, U.S.N.M.; Porto Bello, March, 1912 (Busck).

**ANGITIA ATTINA Druce.**

1. Taboga Island, June, 1911 (Busck).

**ANGITIA TRISTIGMA, new species.**

Fore wing with median and basal spaces black-shaded, irrorate with purplish scales; lines obscured; orbicular, claviform and reniform rounded, similar, in a triangular group, dull olivaceous centered, whitish edged; outer line black, slender, dentate, excurved over cell, followed by a broad olivaceous shade to margin, which is obscured by blackish centrally and preceded by whitish at tornus. Hind wing black-brown, fringe paler. Expanse, 26–28 mm.

*Cotypes.*—One male, one female, No. 15893, U.S.N.M.; Cabima, May, 1911 (Busck).

**CHALENATA USTATA Druce.**

10. Porto Bello, April, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**CHALENATA USTATINA, new species.**

Very similar to *C. ustata* Druce; smaller, the hind wing clear straw-color with very little brown irroration; marginal area of fore wing with lighter ground, the bands better relieved, not diffused. Expanse, 15–16 mm.

*Cotypes.*—One male, one female, No. 15894, U.S.N.M.; selected from a series of eight; Paraiso, Canal Zone, April, 1911 (Busck); Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

Except for the fact that these were taken at the same places and times as *ustata*, I should consider them small individuals of that species, so slight are the differences.

**CHALENEATA QUELLA, new species.**

Male antennæ pectinate. Fore wing dark gray-brown, nearly unmarked; lines pale, dusky edged, subparallel, wavy, indistinct, the outer tinged with a reddish shade; discal dot minute, black; a row of terminal black dots. Hind wing blackish fuscous with terminal black dots and pale fringe. Expanse, 19 mm.

*Cotypes.*—Four males, one female, No. 15897, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**ORTHOLEUCA ALBILUNA Hampson.**

23. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

## VIA, new genus.

Frons with rounded conical prominence; thorax and abdomen without crests; proboscis moderately developed; palpi slender, upturned, reaching vertex, the second joint fringed with scales below, third smooth. Fore wing with veins 3 and 4 from near angle of cell, 5 somewhat above, 7 from apex of cell, 8–10 stalked, 11 oblique, free; hind wing with 3 and 4 connate, 5 slightly below middle of discocellulars, 6 and 7 from apex of cell, 8 anastomosing with cell near base.

*Type of the genus.*—*Via vindicia*, new species.

**VIA VINDICIA, new species.**

Head partly white-scaled on vertex; thorax and abdomen dark purple brown; fore wing of this color, glossy; inner line yellowish white, curved, slightly irregular, distinct; outer line similar, but faint, showing a dot on costa and line above inner margin, occluded centrally; three white specks on costa before apex. Hind wing bronzy black. Expanse, 10 mm.

*Cotypes.*—Eight specimens, No. 15908, U.S.N.M.; La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck).

**ERASTRIODES EMARGINATA Hampson.**

2. Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**AMYNA OCTO Guenee.**

1. Corozal, Canal Zone, July, 1912 (J. Zetek).

## PRODOSIA, new genus.

Fore wing with accessory cell, vein 10 arising from its upper side, 11 free; fore tibiæ unarmed; front of head without prominence; abdomen with small dorsal crest at base and one on third segment; thorax without crests; palpi upturned, the third joint long and exceeding vertex.

*Type of the genus.—Prodosia mycha,* new species.

**PRODOSIA MYCHA, new species.**

Fore wing with the basal three-fifths yellow-brown, followed by a whitish line with two small teeth near costa; the rest of the wing purplish black; subterminal line more or less evident, gently excurved on its middle third. Hind wing blackish fuscous. Expanse, 13–14 mm.

*Cotypes.*—Six specimens, No. 15895, U.S.N.M.; Taboga Island, February, 1912 (Busck); Porto Bello, February, 1912 (Busck).

Possibly the wings are green when fresh. All the specimens are somewhat worn.

**GRÆPERIA COSTALIS Walker.**

1. La Chorrera, May, 1912 (Busck).

**DIASTEMA TIGRIS Guenée.**

20. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek and C. P. Crafts).

**DIASTEMA ARGILLOPHORA, new species.**

Fore wing squarely pointed at apex, outer margin a little concave just below apex; straw-color; a broad creamy white area at base sends out a finger-shaped process centrally to middle of wing, edged by a dark brown shaded line; outer line creamy white, edged within by brown, slightly excurved in its central third, joined to apex by an oblique white shade, followed by a broad purple-brown shade; a row of small terminal dots; veins on a broad costal area finely lined with white. Hind wing shaded with purple-fuscous outwardly; terminal dots as on fore wing. Expanse, 21–23 mm.

*Cotypes.*—One male, seven females, No. 15907, U.S.N.M.; Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

Different in wing-shape and pattern from the other *Diastema* and with the front much more strongly prominent.

**LITHACODIA MERTA Schaus.**

4. Tabernilla, Canal Zone, May, 1907 (Busck); La Chorrera, May, 1912 (Busck); Porto Bello, May, 1912 (Busck):

**MICROPHÆA NYCTICHROA Hampson.**

9. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**TROGOTORNA PERSECTA Hampson.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

**DROBETA BREPHUS, new species.**

Fore wing dark brown, irrorate with lighter scales, the markings obliterate; beyond the outer line a light creamy shade, irregularly broken, extending to apex where it is cut by a dark spot; a small light spot in reniform; a black double streak on upper third of outer margin. Hind wing dark blackish brown. Expanse, 16 mm.

*Cotypes.*—Three males, No. 15892, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**EUSTROTIA PULMONA Dyar.**

3. La Chorrera, May, 1912 (Busck).

**OZARBA OPLORA, new species.**

Fore wing deep brown on basal half, rosy brown outwardly; reniform rosy brown, included in a space limited by the double projection of the outer line on veins 6 and 7; outer line whitish, regularly incurved below vein 6; a black dash following the incisure; subterminal line dusky, slightly waved, followed by a light narrow space. Hind wing blackish fuscous. Expanse, 15 mm.

*Cotypes.*—One male, two females, No. 15898, U.S.N.M.; La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

Allied to *Ozarba tilora* Dyar (*Erastria tilora* Dyar,[1]) but smaller, darker, the markings less relieved, the outer line less drawn in on costa. Also allied to *Ozarba catilina* Druce (*Eustrotia catilina* Druce[2]), but this has a distinct black costal patch beyond the outer line. Also allied to *O. agraria* Schaus, but less closely.[1]

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[1] Proc. U. S. Nat. Mus., vol. 42, 1912, p. 75.

[2] Biol. Cent.-Amer., Lep. Het., vol. 2, 1889, p. 312; Hampson, Cat. Lep. Phal. Brit. Mus., vol. 10, 1910, p. 598.

**COBUBATHA NUMA** Druce.[2]

3. La Chorrera, May, 1912 (Busck); Trinidad River, March, 1912 (Busck).

**COBUBATHA PAIDICA**, new species.

Fore wing dark brown at base, followed by a broad, slightly oblique, pale lilacine band containing a reddish line; median area brown shaded, lighter terminally with long black subapical streaks. Hind wing dark fuscous with pale fringe. Expanse, 10 mm.

*Type*.—Male, No. 15888, U.S.N.M.; Taboga Island, February, 1912 (Busck).

The specimen is in poor condition, so the markings can not be seen in detail.[3]

**COBUBATHA QUADRIFERA** Zeller.

11. Porto Bello, April, 1911 (Busck); Paraiso, Canal Zone, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

The patch on inner margin is brown, not black. The specimens are all smaller than the usual size of North American ones.

**COBUBATHA ICRIA**, new species.

Fore wing dark brown at base, followed by a silvery lilaceous band; median space dark brown, curved within, straight without, indis-

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[1] Modifications of the *oplora* type occur to the southward. Of these, one is—

**OZARBA HEMITECTA**, new species.

Base of fore wing solidly dark brown, the lines nearly obscured; coarsely waved inner and median lines visible; lower half of terminal space, except on the margin, light ocherous; reniform yellowish with a black spot below it inclosed by the outer line, which is shortly angled on costa, excurved over cell, with two blunt teeth at veins 5 and 6; apex dark; subterminal line pale, irregular, illy defined. Hind wing dark fuscous. Expanse, 17 mm.

*Type*.—Male, No. 15899, U.S.N.M.; Aroa, Venezuela (Schaus collection).

Finally the teeth of the outer line are obliterated and it becomes simply excurved as in *Ozarba vicina* Schaus and —

**OZARBA BASCURA**, new species.

*Photedes bascura* Schaus, MS.

Fore wing dark purplish brown at base; basal line forming three scallops, the central one heavy; inner line faint; median more distinct, slender, black, forming an outward projection below cell and a slight angle on vein 1; shortly beyond it the dark color is replaced by pale ocherous, the limiting line forming a projection below cell; the outer pale area is crossed by about four finely wavy red lines, of which the subterminal is shaded with blackish; a truncate triangular costal dark patch; reniform reddish, in a large nearly circular area, with small dark points outwardly. Hind wing dark fuscous. Expanse, 19 mm.

*Type*.—Female, No. 10547, U.S.N.M.; São Paulo, Brazil (Schaus collection).

[2] This species is represented southward by a similar but specifically distinct form.

**COBUBATHA PINAX**, new species.

Fore wing gray-brown, without ocherous tint; patch on inner margin truncate-conical, with a small wedge-shaped mark on costa; a small black dot near base; marks distinctly edged with dull silvery lines; reniform large, pale silvery gray; outer line faint, dark, slender, sharply incurved at reniform and broadly so below; a broad subterminal silvery gray slightly flexuous line; termen narrowly black, toothed opposite cell and submedian. Hind wing blackish brown, fringe whitish. Expanse, 16 mm.

*Type*.—Female, No. 15885, U.S.N.M.; Loja, Ecuador (Coll. P. Dognin).

[3] **COBUBATHA PERIUSIA**, new species.

Fore wing blackish on basal third, with a few lilacine scales, followed by a broad band of sordid ochery brown; bordering this a narrow curved band of deep brown; terminal half of wing blackish, washed with purple, a little mottled with lighter subterminally; a pale spot on costa at apex. Hind wing black-brown, the fringe dark. Expanse, 11 mm.

*Type*.—Female, No. 15889, U.S.N.M.; Tucuman, Argentina, December, 1905 (E. Dinelli).

tinctly cut below cell by an obliquely longitudinal pale ray, the costal segment triangular, followed by a slightly oblique band of silvery lilaceous; terminal area coppery brown with lilacine scales and a black patch near middle of margin; terminal edge coppery brown, fringe black and purple. Hind wing black, a little lighter on the disk, fringe whitish. Below, hind wing gray, rufous tinged outwardly, with discal dot, outer curved dark band and slender submarginal one. Expanse, 11 mm.

*Type.*—Female, No. 15887, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**COBUBATHA ORTHODOXICA, new species.**

Fore wing light gray in ground, shining, overlaid with dark atoms and with dark markings; inner and outer lines wavy, curved, filled in with blackish in lower half; reniform pale, with dark spot preceding; base darkly marked; a black spot before center of outer margin; a row of silver streaks on costa outwardly. Hind wing brown-black. Expanse, 10–11 mm.

*Cotypes.*—Male and female, No. 15886, U.S.N.M.; Corozal, Canal Zone, July, 1912 (C. P. Crafts, J. Zetek).

**COBUBATHA PAISTION, new species.**

Basal half of fore wing pale creamy with reddish tint; outer half purple-brown; base shaded with purple scales, costa outwardly with pale dots; a median darker band edging the purple area within; a narrow pale line on terminal edge. Hind wing fuscous. Expanse, 10 mm.

*Cotypes.*—Five specimens, No. 15890, U.S.N.M.; Taboga Island, February, 1912 (Busck).

**COBUBATHA SUBTERMINATA Hampson.**

7. Taboga Island, February, 1912 (Busck).

**COBUBATHA TORTRICOPSIS, new species.**

Basal half of wing blackish, ending in a median angle; outer area pale grayish, with faint carneous tint; apex darkly shaded, with four small silvery white oblique costal streaks, the inner one the longest; terminal edge black. Hind wing fuscous. Expanse, 8–9 mm.

*Cotypes.*—Two males, No. 15891, U.S.N.M.; Taboga Island, February, 1912 (Busck).

**TARACHIDIA CARMELITA, new species.**

*Male.*—Fore wing sordid yellowish white; base olive gray; a median band of olive gray, oblique, touching a faint discal mark; a similar outer band crossed by the curved outer line, black and shaded above in its outcurve, fainter below; a black speck on fringe at upper third and one at tornus. Hind wing fuscous shaded on margin and veins; fringe pale. Expanse, 13 mm.

*Female.*—Fore wing less yellowish, sordid white; bands as in the male but broader, the outer one shading almost to margin; discal dark patch joined to median band. Hind wing dark fuscous. Expanse, 15 mm.

*Cotypes.*—Three males, two females, No. 15900, Alhajuelo, April, 1911 (Busck).

Resembles *Eublemma minima* Guenée (=*carmelita* Morrison) in general appearance.

**HELIOCONTIA PERSTRUCTANA** Walker.

3. Corozal, Canal Zone, July, 1912 (J. Zetek and C. P. Crafts).

**HELIOCONTIA APICELLA** Grote.

6. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**HELIOCONTIA MARGANA** Fabricius.

15. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**HELIOCONTIA LEPUS CONCORDENS**, new subspecies.

Fore wing with dark brown patch at base; beyond blackish brown, shading lighter to termen, where it is very narrowly yellow; a narrow yellow subcostal dash centrally; a black spot on termen. Hind wing black. Expanse, 16 mm.

*Type.*—Male, No. 15863, U.S.N.M.; Trinidad River, August, 1912 (Busck).

The female is exactly like the male, not dimorphic. I think this is really specifically distinct from *lepus* Guenée, but as Hampson includes under the synonymy *faragma* Schaus and *inversa* Schaus, equally distinct, I describe this as a subspecies only, for the time being.

**SPRAGUEIA DAMA** Guenée.

9. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts, J. Zetek).

**XANTHOPTERA BOTYCIDES** Guenée.

4. Corozal, Canal Zone, March, 1911 (Busck); La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**XANTHOPTERA AURIFERA** Walker.

8. Corozal, Canal Zone, March, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**XANTHOPTERA INTENSIFICA**, new species.

Fore wing deep orange yellow, the outer line distinct, curved, reddish; discal dots minute or absent; the dark gray terminal line in fringe narrow. Hind wing orange-fuscous. Expanse, 15–17 mm.

*Cotypes.*—Three males, one female, No. 15862, U.S.N.M.; La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**XANTHOPTERA NIGROFIMBRIA** Guenée.

15. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

## Subfamily EUTELIINÆ.

**EUTELIA AURATRIX** Walker.

2. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**EUTELIA ABSCONDENS** Walker.

1. La Chorrera, May, 1912 (Busck).

**PÆCTES CIRCULARIS** Herrich-Schäffer.

1. Trinidad River, March, 1912 (Busck).

**PÆCTES FUSCESCENS** Walker.

2. Porto Bello, February, 1911 (Busck); Paraiso, Canal Zone, February, 1911 (Busck).

**PÆCTES PHLOISMA**, new species.

Fore wing gray; inner and outer lines shaded with green; basal space narrowly light gray, with blackish below and on costa, not sharply marked, the inner line indistinct; orbicular and reniform pale, black-ringed; mesial line slender, black, excurved over reniform, coarsely dentate below; outer line triple, excurved over cell, outer segment dentate and followed by a brown-stained streak below vein 6; apex light gray, preceded by a black shade; subterminal line faint, pale. Hind wing black, fringe spotted with whitish; a small pale mark above margin; inner margin streaked with black and white. Expanse, 25 mm.

*Type.*—No. 15910, U.S.N.M.; selected from a series of twelve; Cabima, May, 1911 (Busck); Paraiso, Canal Zone, February, 1911 (Busck).

Size and markings of *P. areusa* Walker, but without the red tint, the basal markings and lines diffused.

**PÆCTES PANBALLA**, new species.

Brownish gray; fore wings with the lines marked with somewhat metallic green; basal space dark, green without; inner line black, indented subcostally and on vein 1, followed by dull lilacine; median space nearly devoid of markings, the stigmata obsolescent; outer line excurved over cell, black, slender, preceded by lilacine and followed by green, indented on vein 1; a subapical dark patch, the apex itself pale; four black dashes subterminally. Hind wing largely blackish. Expanse, 29 mm.

*Type.*—Male, No. 15911, U.S.N.M.; Chiriqui (Schaus collection).

Allied to *P. canofusa* Hampson, but without the white mottlings, the lines distinct and not confused.

## Subfamily STICTOPTERINÆ.

**STICTOPTERA VITREA** Guenée.

10. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, March, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

Five of the females may be referable to *C. fenestra* Guenée, but as there is no male of this species among the Panama collections, the reference can not be made positively.

**STICTOPTERA CLARA Cramer.**

19. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**STICTOPTERA HETEROGRAMMA Hampson.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

### Subfamily SARROTHRIPINÆ.

**CHARACOMA NILOTICA Rogenhofer.**

15. Porto Bello, February and March, 1911 (Busck); La Chorrera, April, 1912 (Busck); Corozal, Canal Zone, April, 1912 (Busck).

**LOPHOSEMA PURPURASCENS Schaus.**

1. Cabima, May, 1911 (Busck).

**CASANDRIA METAPHAEA Hampson.**

5. Cabima, May, 1911 (Busck).

**CASANDRIA CHIRICA Schaus.**

1. Taboga Island, February, 1912 (Busck).

**CASANDRIA LEUCOPIS Schaus.**

1. Cabima, May, 1911 (Busck).

The single specimen is a female and much rubbed, but I think referable to this species.

**CASANDRIA INTERSTITIA, new species.**

Similar to *leucopis*, more shaded with dark red; reniform mark larger; lines similar, mesial line forming a coarser zigzag below; subterminal spots distinct and separated, not shaded together, preceded rather than followed by whitish shading. Hind wing with broader fuscous border.

*Type.*—Female, No. 15912, U.S.N.M.; Cabima, May, 1911 (Busck).

A male from Guapiles, Costa Rica (W. Schaus), has more white shading, especially preceding the subterminal spots. Hind wing pure white to the margin without terminal line.

**CASANDRIA ABSEUZALIS Walker.**

1. La Chorrera, May, 1912 (Busck).

**CASANDRIA FUGAX, new species.**

Fore wing rather dark soiled gray, the veins indicated; lines slender, black, the inner curved, a little angled but not dislocated; median line visible below cell, coarsely toothed; reniform circular with central reddish dot; outer line indistinct; subterminal dots clouded. Hind wing pure white. Expanse, 26 mm.

*Cotypes.*—Two males, No. 15913, U.S.N.M.; Cabima, May, 1911 (Busck); Porto Bello, May, 1911 (Busck).

**CASANDRIA ILLEGITIMA, new species.**

Fore wing like *fugax*, rather darker and more sordid. Hind wing translucent, opalescent, entirely shaded with smoky black, the veins darker. Expanse, 25 mm.

*Type.*—Male, No. 15914, U.S.N.M.; Cabima, May, 1911 (Busck).

**CASANDRIA MURORA, new species.**

Dark gray; terminal space broadly lighter and containing the subterminal dashes, pointed, subsagittate; basal space a little darker, edged by a curved line, the other lines obsolete; discal venules dark; reniform indicated, pale, with central dot. Hind wing white, with gray border on termen and ends of veins, broader in the female than in the male. Expanse, 26 mm.

*Cotypes.*—Male and female, No. 15915, U.S.N.M.; Paraiso, Canal Zone, February, 1911 (Busck); Bocas del Toro, April, 1907 (W. Schaus).

**CASANDRIA GRISELDA, new species.**

Smooth dark gray with reddish tint; lines much as in *abseuzalis* but gray, faint, scarcely legible on the dark ground; subterminal dots sagittate and subconfluent, black, distinct, forming a dentate subterminal line; terminal dashes obscure. Hind wing fuscous, veins darker. Expanse, 24–26 mm.

*Cotypes.*—Three females, No. 15917, U.S.N.M.; La Chorrera, May, 1912 (Busck); Orizaba, Mexico (Schaus collection); Aroa, Venezuela (Schaus collection).

**CASANDRIA ARÆA Schaus.**

1. Trinidad River, March, 1912 (Busck).

A badly rubbed female, but I think certainly to be this species.

**CASANDRIA FLOTSAMA, new species.**

Gray; fore wing stained with reddish, all the marks obliterated, only a large irregular reniform ring in dull red, formed by a segment of the outer line distantly bordering the reniform spot, as this marking is modified in *steniptera* Schaus; dark streaks at base; a dark gray clouded subterminal shade, rising broadly on inner margin, narrowing above, edged outwardly by a little pale gray. Hind wing dark fuscous. Expanse, 20 mm.

*Type.*—Female, No. 15918, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**CASANDRIA SIOPERA, new species.**

Costa gray in and beyond cell; subterminal line blurred, dentate; the rest of the wing carneous gray, the lines faintly indicated in dark red; reniform round, pale with red center. Hind wing pure white in the male, with broad blackish border in female, running up along the veins. Expanse, 26 mm.

*Cotypes.*—Two specimens, No. 15916, selected from a series of twelve; La Chorrera, May, 1912 (Busck); Cordoba, Mexico, May, 1906 (W. Schaus); Orizaba, Mexico (Schaus collection and R. Müller).

Sir G. F. Hampson examined one of the Mexican specimens and pronounced it to be his *C. hæmatopis*, described from Argentina. It appears to me to differ in the presence of the heavy gray costal shade and in the course of the lines, to judge by Hampson's figure and description. His male specimen from San Salvador is probably the present species.

**ISCADIA LEENA Druce.**

*Gadirtha* (?) *leena* DRUCE, Biol. Cent.-Amer., Lep. Het., vol. 2, 1898, p. 508.

4. Porto Bello, March, 1912 (Busck); Cabima, May, 1911 (Busck).

The present species does not agree well with the characterization of the subfamily "retiaculum of male bar-shaped," the structure being a fold, twice as wide as long. But as *Casandria stroca* Schaus has an entirely similar structure and *Iscadia aperta* Walker has no retinaculum at all, the species may be included here among the other exceptions.

**MEDAVA DIMINUTA, new species.**

Fore wing whitish gray, shaded with purple at base and narrowly along costa; inner line slender, denticulate, broken into three black points in the cell; outer line denticulate, followed by whitish, starting from costa above the large annular reniform, making a broad half circle to below reniform, then to inner margin; subterminal line blackish, denticulate; terminal dots small, in a purplish shade. Hind wing black on the margin, pale over the disk; fringe whitish. Expanse, 18 mm.

*Type*.—Male, No. 15919, U.S.N.M.; Corozal, Canal Zone, June, 1912 (Busck).

Hampson's diagnosis of the genus *Medava* in his key [1] is in error in placing it in the section "Palpi with the third joint long and dilated at extremity." This joint is really short, as described on page 450.

## EGCHIRETES, new genus.

Fore wing with veins 7–8 from end of accessory cell, 9 absent, 10 from top of accessory cell, 11 free. Hind wing with 4 absent, 3 and 5 from cell. Palpi with the second joint fringed above with hair toward extremity, third joint moderate, tapered. Fore wing convex at base as in *Sarrothripa*.

*Type of the genus*.—*Egchiretes nomimus*, new species.

**EGCHIRETES NOMIMUS, new species.**

Dark gray; fore wing with a white patch on inner margin at basal third; subbasal line double, slender, blackish, from costa to submedian; black dashes on subcostal and a spot on submedian; inner line blackish, waved, filled by whitish; two black discal points in a white spot, followed by a white streak toward apex; outer line black, fine, single, denticulate, gently curved, with an inward dentation at vein 2, followed by white; subterminal line whitish, preceded by fuscous, broken by a white spot below costa; minute terminal black dots joined by a slender line. Hind wing grayish black. Expanse, 18 mm.

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[1] Cat. Lep. Phal. Brit. Mus., vol. 11, 1912, p. 223.

*Type.*—Female, No. 15920, U.S.N.M.; Alhajuelo, April, 1911 (Busck).

NOTE.—For the remaining subfamilies of the Noctuidæ, namely, the Catocalinæ, Plusiinæ, Noctuinæ, and Hypeninæ, the indispensable volumes of Sir G. F. Hampson's Catalogue of the Lepidoptera Phalænæ were not available at the time of writing. Two are before me as proof is read, but to use them would require a complete resetting of the type. In the following the subfamilies and genera will be found mixed, the arrangement being provisional. Mr. William Schaus has worked over the Hypeninæ, but I am unable to incorporate his results in this paper.

### Subfamily PLUSIINÆ.

**PLUSIA VERRUCA** Fabricius.

1. Porto Bello, February, 1911 (Busck).

**PLUSIA ROGATIONIS** Guenée.

2. Corozal, Canal Zone, July, 1912 (J. Zetek).

**CONCANA HOSHEA** Druce.

1. La Chorrera, May, 1912 (Busck).

**CONCANA LECTA** Schaus.

1. La Chorrera, May, 1912 (Busck).

**ORÆSIA EXCITANS** Walker.

2. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**GONODONTA GINALDUS** Guenée.

1. Cabima, May, 1911 (Busck).

**GONODONTA IMMACULA** Guenée.

1. Cabima, May, 1911.

**GONODONTA PYRGO** Cramer.

1. Corozal, Canal Zone, July, 1912 (J. Zetek).

### Subfamily HYBLAEINÆ.

**HYBLAEA PUERA** Cramer.

2. La Chorrera, May, 1912 (Busck).

**SOSXETRA GRATA** Walker.

4. Corozal, Canal Zone, March, 1911 (Busck); Trinidad River, March, 1912 (Busck).

### Subfamily NOCTUINÆ.

**EREBUS ORORA** Linnaeus.

5. Paraiso, Canal Zone, May, 1911 (Busck); Ancon, Canal Zone (O. Celestino, B. G. Ireno).

**LETIS MYCERINA** Fabricius.

5. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1911 (Busck).

**LETIS HERCYNA** Drury.

2. Cabima, May, 1911 (Busck).

**LETIS TIASA** Druce.

1. Cabima, May, 1911 (Busck).

**LETIS HERCULIA** Cramer.

7. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, February, 1911 (Busck).

**LETIS MAGNA** Snellen.

5. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, February and March, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

**LATEBRARIA AMPHIPYROIDES** Walker.

1. Taboga Island, February, 1912 (Busck).

**MAZAEZLA RELATA** Walker.

1. Paraiso, Canal Zone, January, 1911 (Busck).

**AZETA RHODOGASTER** Guenée.

5. Taboga Island, June, 1911 (Busck).

**OBROATIS OCELLATA** Butler.

1. La Chorrera, May, 1912 (Busck).

**PEOSINA NUMERIA** Drury.

1. Taboga Island, June, 1911 (Busck).

**BOLINA FASCIOLARIS** Guenée.

2. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**MELIPOTIS JANUARIS** Guenée.

8. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, February, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**BENDIS FORMULARIS** Hübner.

5. Corozal, Canal Zone, March, 1911 (Busck); Porto Bello, May, 1911 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**BENDIS SIAHA** Schaus.

1. Taboga Island, February, 1911 (Busck).

**HYPOCALA ANDREMONA** Cramer.

3. Paraiso, Canal Zone, January, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**OPHISMA PRITANIS** Cramer.

1. Cabima, May, 1911 (Busck).

**OPHISMA ABLUNARIS** Guenée.

1. Cabima, May, 1911 (Busck).

**OPHISMA DIATONICA** Möschler.

1. Paraiso, Canal Zone, June, 1911 (Busck).

**CŒNIPETA LOBULIGERA** Guenée.

2. Porto Bello, March, 1911 (Busck); Trinidad River, May, 1911 (Busck).

**CŒNIPETA TANAIS** Cramer.

2. Paraiso, Canal Zone, January and February, 1911 (Busck).

**CŒNIPETA COMPETRIX** Hübner.

26. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck).

**CŒNIPETA LIBITRIX** Hübner.

1. Corozal, Canal Zone, March, 1911 (Busck).

**CŒNIPETA SERAPIS** Cramer.

7. Paraiso, Canal Zone, January, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**NOROPSIS HIEROGLYPHICA** Cramer.

6. Trinidad River, February, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, August and November, 1912 (C. P. Crafts).

**MASSALA IMITANS** Walker.

4. Corozal, Canal Zone, March, 1911 (Busck); Porto Bello, March, 1911 (Busck); Cabima, May, 1911 (Busck).

**CEROMAERA TYMBER** Cramer.

3. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**CEROMAERA ARDALUS** Druce.

1. Corozal, Canal Zone, April, 1911 (Busck).

**CAMPOMETRA LAURENA** Schaus.

6. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck).

**CAMPOMETRA PACIFICA** Walker.

1. Paraiso, Canal Zone, February, 1911 (Busck).

This differs from *laurena* only in having a black shade in lower half of median space.

**CAMPOMETRA SUBLUCIDA** Walker.

1. Alhajuelo, April, 1911 (Busck).

**CAMPOMETRA MERETRICIA** Schaus.

1. Cabima, May, 1911 (Busck).

**ITHONIA EXPONENS** Walker.

2. Taboga Island, February, 1912, and June, 1911 (Busck).

**LEPIDODES LIMBULATA** Guenée.

1. La Chorrera, May, 1912 (Busck).

**OLYSSA DARES** Cramer.

1. Taboga Island, February, 1912 (Busck).

**GALEPHA AZETA** Druce.

1. Paraiso, Canal Zone, January, 1911 (Busck).

**SELENIS GALLINAGO** Felder and Rogenhofer.

2. La Chorrera, May, 1912 (Busck).

**PARACHABORA ABYDAS Warren.**

2. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck).

**TETRATOCERA ERYCATA Cramer.**

3. Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**CHAMINA HOMICHLODES Hübner.**

3. Cabima, May, 1911 (Busck).

**FOCILLA GUERINI Guenée.**

1. Panama City, April, 1913 (B. G. Ireneo).

**ISOGONA ÆOLIA Druce.**

1. La Chorrera, May, 1912 (Busck).

**ISOGONA NATATRIX Guenée.**

1. La Chorrera, May, 1912 (Busck).

**FOCILLA INCONSTANS Schaus.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**CAPNODES LOTHOS Cramer.**

2. La Chorrera, May, 1912 (Busck); Trinidad River, March, 1912 (Busck).

**CAPNODES APICATA Schaus.**

2. Cabima, May, 1911 (Busck).

**CAPNODES CHICA Schaus.**

1. Cabima, May, 1911 (Busck).

**CAPNODES FLAGRANS Walker.**

1. La Chorrera, May, 1912 (Busck).

**CAPNODES DISTACTA Hübner.**

1. Corozal, Canal Zone, April, 1912 (Busck).

**CAPNODES RUFINANS Guenée.**

3. Corozal, Canal Zone, March, 1911 (Busck).

**CAPNODES DEOIS Schaus.**

1. Trinidad River, March, 1912 (Busch).

**CAPNODES MODESTA Butler.**

5. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**CAPNODES BARINE Schaus.**

3. Corozal, Canal Zone, June, August and November, 1912 (Busck).

**CAPNODES SUFFICIENS Walker.**

1. Trinidad River, June, 1912 (Busck).

**CAPNODES MELIS Schaus.**

1. Trinidad River, June, 1912 (Busck).

**CAPNODES PHÆDRA Schaus.**

1. Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**CAPNODES MUNDICOLA Walker.**

2. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**CAPNODES TYROE Schaus.**
1. Taboga Island, August, 1911 (Busck).

**CAPNODES PALLIFASCIENS Walker.**
1. Trinidad River, March, 1912 (Busck).

**CAPNODES ANTHEA Schaus.**
3. Trinidad River, March and June, 1912 (Busck); Taboga Island, June, 1911 (Busck).

**CAPNODES ALCINOE Druce.**
1. La Chorrera, May, 1912 (Busck).

**DAGASSA MARGINATA Warren.**
4. Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**DAGASSA CURVILINEA Druce.**
1. Porto Bello, February, 1911 (Busck).

**DAGASSA CROCEICEPS Walker.**
10. La Chorrera, May, 1912 (Busck); Trinidad River, March, 1912 (Busck).

**SELENIS SUERO Cramer.**
3. Cabima, May, 1911 (Busck).

**SELENIS SUEROIDES Guenée.**
1. Cabima, May, 1911 (Busck).

**SELENIS HERMELINA Guenée.**
4. La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**EPHYRODES BIPUNCTATA Walker.**
2. Porto Bello, April, 1912 (Busck); Taboga Island, June, 1911 (Busck).

**HYPOGRAMMA DAMONA Cramer.**
2. Paraiso, Canal Zone, January, 1911 (Busck).

**BARYDIA JAPETA Cramer.**
1. Trinidad River, June, 1912 (Busck).

**SAFIA MINTA Schaus.**
1. La Chorrera, May, 1912 (Busck).

**AZATHA MARCELLINA Cramer.**
1. Cabima, May, 1911 (Busck).

**ORSA FLAVA Schaus.**
2. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck).

**ARGIDIA RUFA Schaus.**
1. Porto Bello, March, 1911 (Busck).

**PARANYMPHA TOXEA Cramer.**
3. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**PLACONIA DEMERA Schaus.**
1. Trinidad River, March, 1912 (Busck).

Schaus's type of this species is from Chiriqui, Panama.

**YRIAS LINEATA Druce.**

6. Trinidad River, March, 1912 (Busck).

**COXINA HADENOIDES Guenée.**

1. Corozal, Canal Zone, April, 1911 (Busck).

**TRIOMMATODES PADRINA Schaus.**

1. La Chorrera, May, 1912 (Busck).

**BETUSA AMYNTA Cramer.**

1. Alhajuelo, April, 1911 (Busck).

**BRUGAS INFANS Guenée.**

1. Trinidad River, March, 1912 (Busck).

**PLUSIODES (?) LARONIA Druce.**

1. La Chorrera, May, 1912 (Busck).

**ARSACIODES RUFA Hampson.**

4. Porto Bello, February, 1911 and April, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**OMMATOCHILA MUNDULA Zeller.**

2. Paraiso, Canal Zone, February, 1911 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**CELIPTERA GAMOTI Guenée.**

1. Alhajuelo, April, 1911 (Busck).

**PHURYS FLEXA Guenée.**

1. Trinidad River, March, 1912 (Busck).

**PHURYS IMMUNIS Guenée.**

6. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck) and July, 1912 (J. Zetek).

Typical *immunis* comes from the Antilles. The present form has the markings more distinct, less blurred, less brilliant, the subterminal dots well relieved on an uniform dark gray ground, reniform well marked. It extends northward into Mexico.

**POAPHILA PAUCULA Walker.**

9. Taboga Island, February, 1912 (Busck); Porto Bello, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**POAPHILA IMMANIS Guenée.**

2. Paraiso, Canal Zone, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

Two females, probably referable here, but in poor condition.

**REMIGIA LATIPES Guenée.**

3. Porto Bello, March 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, *1912* (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**REMIGIA MARCIDA Guenée.**

2. Cabima, May, 1911 (Busck).

**REMIGIA DISSEVERANS Walker.**

7. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck), and July, 1912 (J. Zetek); Cabima, May, 1911 (Busck).

The specimens are somewhat grayer, but appear to agree specifically with a series from Santo Domingo, Cuba, and Jamaica, which I consider to be Walker's *disseverans*. Apparently there are three distinct species here, *latipes* Guenée, ranging from Argentina to the United States, including the West Indies; *disseverans* Walker, from the Greater Antilles to Florida, Texas, Central America, and Panama; and *marcida* Guenée, from Texas, Mexico to Panama. These three species all occur in the United States and have been regarded as varieties of *repanda* Fabricius. This, however, comes from the Lesser Antilles and can be distinguished at once from *disseverans*, which it otherwise resembles, by the abundant dense yellow scaling on the underside of the hind wings of the male. The larvæ described by me as *latipes*[1] should be referred to *disseverans*.

**GONITIS EDETRIX Guenée.**

1. Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**ANOMIS EXACTA Hübner.**

7. Trinidad River, March, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek and C. P. Crafts).

**ANOMIS ŒDEMA Guenée.**

2. Trinidad River, March, 1912 (Busck).

**ANOMIS INNOCUA Schaus.**

2. Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

Very small specimens, badly worn. If not referable here, it is a new species, but the specimens are unfit to describe.

**EULEPIDOTIS METALLIGERA Butler.**

7. Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**EULEPIDOTIS HEMITHEA Druce.**

2. Chiriqui (Schaus collection).

**EULEPIDOTIS BOURGAULTI Bar.**

5. Porto Bello, February, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**EULEPIDOTIS NORDUCA Schaus.**

1. La Chorrera, April, 1912 (Busck).

**EULEPIDOTIS JUNETTA, new species.**

Bright brown, the apex of fore wing shading to ocher-brown; inner line straight, oblique, metallic leaden within, red-brown without;

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[1] Proc. U. S. Nat. Mus., vol. 23, 1901, p. 276.

mesial line gray, flexuous, curved a little on costa and marked with a leaden bar; outer line straight, metallic leaden, edged with brown, touching outer margin above tornus; terminal line straight, leaden, placed before the margin. Hind wing with silvery blue curved patch outwardly, followed by violet shadings to margin; a narrow faint terminal line, placed as on fore wing. Expanse, 25 mm.

*Cotypes.*—Two specimens, No. 16438, U.S.N.M.; Tabernilla, Canal Zone, May, 1907 (Busck).

**EULEPIDOTIS JUNCIDA Guenée.**

76. Porto Bello, March, 1911 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, July 1912 (C. P. Crafts, J. Zetek).

Both the light form *juncida* and the dark one *mabis* Guenée are present in the long series, with intergrades.

**EULEPIDOTIS CŒRULEILINEA Walker.**

8. Porto Bello, February, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**EULEPIDOTIS MUSTELA Druce.**

1. Porto Bello, February, 1911 (Busck).

**EULEPIDOTIS EZRA Druce.**

1. Porto Bello, March, 1911 (Busck).

**EULEPIDOTIS AFFINIS Schaus.**

1. Cabima, May, 1911 (Busck).

**EULEPIDOTIS RECTIMARGO Guenée.**

10. Porto Bello, February, 1911 (Busck).

**EULEPIDOTIS ELECTA, new species.**

Similar to *rectimargo* Guenée, but with the white margin of fore wing very narrow or obsolete and with a large apical brown patch on hind wing. Hind wing largely or entirely shaded with ocher. The specimens average slightly larger than *rectimargo*. Expanse, 34 mm.

*Type.*—No. 16439, U.S.N.M.; selected from the 10 Porto Bello specimens, in all 25 in series; Cuernavaca, Mexico, July, 1906 (W. Schaus); Cordoba, Mexico (R. Müller); Orizaba, Mexico, September, 1908 (R. Müller); Mexico City, Mexico, June, 1906 (R. Müller); Juan Vinas, Costa Rica, May, 1906 (W. Schaus); San José, Costa Rica, October, 1906 (W. Schaus); Porto Bello, Panama, February, 1911 (A. Busck); Panama, May, 1907 (W. Schaus); Merida, Venezuela (S. E. Briceno); Aroa, Venezuela (Schaus collection).

**EULEPIDOTIS GUTTATA Felder and Rogenhofer.**

18. Cabima, May, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**EULEPIDOTIS PERLATA Guenée.**

10. Paraiso, Canal Zone, February, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Trinidad River, March and June, 1912 (Busck).

**EULEPIDOTIS TESTACEICEPS** Felder and Rogenhofer.

1. Tabernilla, Canal Zone, May, 1907 (Busck).

**EULEPIDOTIS ALABASTARIA** Hübner.

6. Paraiso, Canal Zone, January, 1911 (Busck): Porto Bello, February, 1911 (Busck).

**EULEPIDOTIS CAUDATA** Herrich-Schäffer.

1. Trinidad River, June 1912 (Busck).

**DYOMYX EGISTA** Bar.

2. Porto Bello, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**DYOMYX CONSEQUENS** Dyar.

1. Chiriqui (Schaus collection).

**DYOMYX INFERIOR** Herrich-Schäffer.

1. Cabima, May, 1911 (Busck).

**DYOMYX ORA** Dyar.

1. Paraiso, Canal Zone, February, 1911 (Busck).

**DYOPS? TELMELA** Schaus.

1. La Chorrera, May, 1912 (Busck).

**BOLETOBIA RUGOSA**, new species.

Sooty black; terminal space lighter, but broadly tinted with pale brownish; lines obscure, the outer denticulate, excurved over cell, with white in the denticulations outwardly, similar on both wings. Expanse, 15 mm.

*Type.*—Male No. 15922, U.S.N.M.; selected from a series of six; Trinidad River, March, 1912 (Busck). Others from Cabima, May, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Taboga Island, February, 1912 (Busck).

Resembles *B. marginalta* Schaus, but is smaller, with much less of the pale color on margin, and mesial line less broadly excurved. *B. turpis* Schaus is larger and darker. *B. tenebrosa* Schaus is the nearest, but seems different, being more uniformly colored and without the distinct whitish sinuous line on the hind wing below shown in *rugosa*.

**PLYNTERIA FLORENS** Schaus.

2. Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**PLYNTERIA COSTATA** Schaus.

2. Cabima, May, 1911 (Busck).

**PLYNTERIA CENTRIPONENS**, new species.

Brown, not very dark; discal dots on both wings large and black; lines slender, dark; inner curved; orbicular a point; outer line wavy, excurved over cell; subterminal line a trace; costa dotted; a terminal line broken at the veins. Hind wing with discal spot and outer line like fore wing. Expanse, 16 mm.

*Type*.—Female, No. 15923, U.S.N.M.; selected from a series of nine; La Chorrera, May, 1912 (Busck). Others from Taboga Island, February, 1912 (Busck); Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**PLYNTERIA MELANOPASA, new species.**

Short and broad winged; black, scarcely irrorate, but enough so to show the lines faintly darker, rather broad; inner curved, outer excurved over cell; subtermined indicated by pale scales; costa with pale dots; discal spot faintly yellowish, oblique. Hind wing with dark discal dot and outer line, very faint. Expanse, 13 mm.

*Type*.—Male, No. 15924, U.S.N.M.; selected from a series of nine; La Chorrera, May, 1912 (Busck); others from Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck).

**PLYNTERIA IRRESPONDENS, new species.**

Dark brown, not black; costa touched with an ocherous tint to beyond the outer line, dotted thence to apex; lines obscure, dark, coarsely and slightly waved; discal marks reduced nearly to obliteration, a few white scales in reniform; a terminal dark line interrupted by ocher points at ends of veins. Hind wing with discal dot, obscure but marked by a few white scales; mesial line dark, angular. Expanse, 16 mm.

*Type*.—Male, No. 15925, U.S.N.M.; selected from a series of six; all males; Trinidad River, March, 1912 (Busck). One other from Corozal, Canal Zone, June, 1912 (Busck).

*Ostha nomion* Schaus resembles this, but is browner, narrower winged, and without the costal pale shading.

**PLYNTERIA MAISES, new species.**

Smooth dark brown; a broad bright ocher band on costa to beyond cell, where it widens; lines lost; a group of yellow scales for discal spot on hind wing. Palpi, vertex and anterior part of thorax mixed with yellow scales. Beneath, costa of fore wing washed with yellow; hind wing yellow, irrorated with brown; a broad terminal brown band. Expanse, 15 mm.

*Type*.—No. 15926, U.S.N.M.; Porto Bello, February, 1911 (Busck).

The specimen is badly broken, but the markings visible.

**PLYNTERIA CONTENTA, new species.**

Bronzy brown, like *florens* Schaus. Discal mark dark, obscure; lines obliterated, visible only in oblique light; outer of fore wing blackish, denticulate, scarcely excurved, without white edgings. Line of hind wing bent at right angles in the middle; no terminal dots. Expanse, 15 mm.

*Type*.—Female No. 15927, U.S.N.M.; Trinidad River, June, 1912 (Busck).

Nearest to *florens;* smaller and without any white scales.

**PLYNTERIA DILMIS, new species.**

Wings trigonate, normal. Dark brown, lines pale, ocherous tinted; inner nearly straight; outer coarsely wavy and excurved somewhat over cell. Stigmata dark, the orbicular with a white point, reniform with two, of which the upper is minute; very minute ocher terminal dots. Hind wing similar; no discal dot, the mesial line pale, curved. Expanse, 16 mm.

*Type.*—Female, No. 15928, U.S.N.M.; Cabima, May, 1911 (Busck).

**PLYNTERIA EXTIRPENS, new species.**

Somewhat round-winged like *irrespondens* or *florens*. Brown-gray with a violaceous cast; markings reduced, but the terminal dots of both wings dark and heavy, narrowly cut by pale at the veins. Discal marks dark, somewhat lunate; outer line of fore wing running close in, narrowly excurved over discal mark; of hind wing similar. Nothing visible in terminal field. Expanse, 14 mm.

*Type.*—Female, No. 15929, U.S.N.M.; Trinidad River, June, 1912 (Busck).

**PLYNTERIA CORYPHATA, new species.**

Similar to *contriponens*, but the wings more pointed at apex, the discal dots inconspicuous; lines slender, blackish, the subterminal less distinct than in *centriponens;* orbicular a black dot; reniform on both wings dusky, marked by white scales. Expanse, 14 mm.

*Type.*—Male, No. 15930, U.S.N.M.; selected from a series of four; La Chorrera, May, 1912 (Busck). Others from Trinidad River, March, 1912, and Taboga Island, February, 1912 (Busck).

**PLYNTERIA UNIFACTA, new species.**

Large, bronzy blackish, like *costata*, but less brown and without the white subcostal line; lines dark as in *costata*, obscure. Hind wing with central line only shown; reniform with a few white scales; a pale dash on costa opposite and three before apex; minute white terminal points as in *costata*. Expanse, 25 mm.

*Type.*—Female, No. 15931, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**PLYNTERIA CONFORMENS, new species.**

Dark brown with olive-yellow tint, especially through median area of both wings. Lines distinct, black; inner curved, irregular; outer denticulate, excurved over cell, followed by white specks in the incisures; reniform large, black, centered by white scales; terminal black line cut by pale dots. Hind wing with discal dot and outer line as on fore wing, the discal dot small. Expanse, 18 mm.

*Type.*—Female, No. 15932, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Quite distinct from any of the forms before me, though of the same general type.

### Subfamily HYPENINÆ.

**RHÆSENA NELIASALIS** Walker.

2. Porto Bello, February, 1911 (Busck).

**RHÆSENA ZOUM,** new species.

Aspect of *nezula* Schaus, but the male without the fovea in the disk of hind wing. The outer line makes a smaller loop beyond the vertical shade; subterminal line without white, etc.

*Type.*—Male, No. 15944, U.S.N.M.; selected from a series of nine, Trinidad River, June, 1912 (Busck); La Chorrera, May, 1912 (Busck); also one from Zent District, Costa Rica, February, 1907 (W. Schaus), this latter labeled as *nezula.*

**RHÆSENA DARCONIS** Schaus.

2. Trinidad River, June, 1912 (Busck).

**HOMOPYRALIS VIRIDIS** Schaus.

2. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**HOMOPYRALIS ELONGATA** Schaus.

1. Trinidad River, June, 1912 (Busck).

**HOMOPYRALIS NIREUS** Schaus.

1. Trinidad River, June, 1912 (Busck).

**HOMOPYRALIS PRÆUSTALIS** Hübner.

2. Trinidad River, March and June, 1912 (Busck).

**METALECTRA PRÆCISALIS** Hübner.

1. Cabima, May, 1911 (Busck)

**METALECTRA PUNCTILINEA** Walker.

2. Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

Two males in poor condition, apparently referable to this species.

**METALECTRA CONTACTOIDES,** new species.

Hind wing rounded, finely crenulate on the margin. Brown, rather light and a little purplish. Fore wing black at base, the inner line just beyond, fine, obscure; orbicular a dot; reniform a quadrate patch, crossed by the heavy mesial band, slightly incurved below; outer line slender, black; subterminal crenulate, near margin; terminal line crenulate and dotted. Hind wing with large discal patch, duplicated below by heavy mesial line; outer line straight, rather heavy, obsolete above cell; termen as on fore wing. Expanse, 24 mm.

*Type.*—Male, No. 15937, U.S.N.M.; Trinidad River, June, 1912 (Busck).

Resembles the North American *M. contacta* Walker.

**METALECTRA MONOPAIS,** new species.

Small; black mixed with whitish to a dark gray; discal marks of both wings large, round, black; anal tuft of male ocher. Lines black, indistinct, with whitish borders more distinct than the lines; subterminal line white, sinuous; terminal black dots with white ones in the fringe. Hind wing with mesial line without white edge. Expanse, 15 mm.

*Type*.—Male, No. 15938, U.S.N.M., selected from a series of six; Trinidad River, March, 1912 (Busck). Others from Taboga Island, February, 1912 (Busck); Porto Bello, February, 1911 (Busck); La Chorrera, April, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**METALECTRA DIDYMA, new species.**

Dark violaceous brown, somewhat irrorate, but on the whole smooth; lines fine black, denticulate, with white specks in the hollows on both wings. Fore wing blackish shaded at base; orbicular a point; reniform small, followed by a white patch; subterminal line obsolete. Hind wing with small black discal dot, crossed by a straight black shade to inner margin; a marginal crenulate black line on both wings. Expanse, 14 mm.

*Type*.—Male, No. 15937, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Palpi upturned, fringed with scales in front, the third joint round, small, almost spherical.

**METALECTRA MOCHTHEROS, new species.**

Like *didyma* in color and markings, but nearly twice the size; palpi oblique, smoothly scaled, the third joint long and pointed. White discal spot of fore wing smaller than in *didyma*. Hind wing with mesial black band slight. No dark shading at base of wings, the general tone rather lighter. Expanse, 22 mm.

*Type*.—Male, No. 15940, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**METALECTRA TRISTIGMA, new species.**

Palpi oblique, second joint with hairs on upper side, third long, acute. Ground color of fore wing whitish, shaded with violaceous gray; inner line marked by a triangle on costa; a large, round black spot just above the inner margin; mesial violaceous shade twice waved, shaded outwardly; outer line obscure, in whitish; an apex violaceous gray; a black triangular spot near middle of margin and a small one above tornus; margin darker violaceous shaded with whitish subterminal line; terminal line fine, black, crenulate on both wings. Expanse, 20 mm.

*Type*.—Male, No. 15941, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**METALECTRA PARALAPPA, new species.**

Resembles *Homopyralis lappa* Druce. Purplish ground of wings less dense, more irrorate with whitish; inner line with only a narrow black costal patch, not the lower markings; subapical patch truncate apically, not semicircular; discal mark black, narrow, nearly broken. Hind wing with large somewhat comma-shaped discal bar. No black patches on central line. Expanse, 26 mm.

*Type*.—Female, No. 15942, U.S.N.M.; Cabima, May, 1911 (Busck.)

**METALECTRA DIVERSATA, new species.**

Ground color light reddish gray, washed with dark purple shades. On the fore wing the shade covers the lower half of base and space from mesial to outer lines and runs out centrally to margin. On hind wing it covers all but the narrow base of wing. Lines slender, dark, wavy; inner line crossing the punctiform orbicular; mesial line across the narrow reniform; outer excurved above; subterminal line a dark even-shaded band. Hind wing with inner line at edge of the pale area; outer line denticulate, obscured in the dark color. Black terminal crenulate lines on both wings. Expanse, 19 mm.

*Type.*—Male, No. 15943, U.S.N.M.; Corozal, Canal Zone, April, 1911 (Busck). Also a female from the same place, June, 1912 (Busck).

**MULELOCHA BILUNULALIS Walker.**

1. La Chorrera, May, 1912 (Busck).

**MULELOCHA CELITA Schaus.**

1. La Chorrera, May, 1912 (Busck).

**MULELOCHA CALLIGRAMMA Hübner.**

1. Corozal, Canal Zone, March, 1911 (Busck).

**MULELOCHA AGNA Druce.**

1. Corozal, Canal Zone, August, 1912 (C. P. Crafts).

**MULELOCHA SUBNIGRA Schaus.**

5. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**BANIANA VELUTA Schaus.**

1. Trinidad River, March, 1912 (Busck).

**BANIANA POHLI Felder.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

**BANIANA PROJICIENS Butler.**

3. Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

**BANIANA TINCTICOLLIS Walker.**

1. Trinidad River, June, 1912 (Busck).

**BANIANA PHRUXUS Schaus.**

1. La Chorrera, May, 1912 (Busck).

**PHARGA ANDACA Druce.**

1. Cabima, May, 1911 (Busck).

**PHARGA ABSORPTALIS Walker.**

2. La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**HERMINIODES CONCATENALIS Walker.**

2. La Chorrera, May, 1912 (Busck).

**HERMINIODES INSULSA Dognin.**

1. Trinidad River, March, 1912 (Busck).

**HERMINIODES ATRISIGNATA Walker.**

1. La Chorrera, May, 1912 (Busck).

**HERMINIODES LATRIS** Schaus (?).

3. La Chorrera, May, 1912 (Busck).

The specimens (male and female) are near the female type of *latris*, but not identical.

**HERMINIODES LONGISTRIATA** Schaus.

3. La Chorrera, May, 1912 (Busck).

**PTERHEMIA EXCISSA** Schaus.

1. Cabima, May, 1911 (Busck).

**ANOBA TRIGONOIDES** Walker.

1. Taboga Island, June, 1912 (Busck).

**POESULA TINCTICOLLIS** Walker.

2. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**TRAUAXA LUA** Druce.

4. Taboga Island, February, 1912 (Busck); La Chorrera, May, 1912 (Busck).

### POGOPUS, new genus.

Proboscis well developed; palpi porrect, extending about the length of the head in the male, fringed with long hair beneath to the tip, in the female the second joint thickened with scales, the third long, smooth; front smooth; eyes large, round; antennæ of male with bristles and cilia, of female with the bristles somewhat smaller; abdomen with a small tuft at base; metathorax with small high posterior crest; tibiæ of male with abundant long hair, of female with slight hair without. Fore wing with apex slightly produced, square; areole present, vein 7 from its apex, 8–9 long-stalked, 10 from upper side of aerole. Hind wing with vein 5 strong, from well below middle of discocellulars; 3–4 shortly stalked.

*Type of the genus.—Pogopus mictochroma*, new species.

**POGOPUS MICTOCHROMA**, new species.

Ocher-brown, mixed with mottlings of lighter ocher, shaded and lined with dark brown. A dot at base; inner line straight across wing, coarsely waved; outer line excurved over cell, wavy below; a brown shade in upper half of median space, often absent; orbicular a black dot; reniform a white speck; subterminal shade irregular, inbent opposite cell, edged without with ocherous; margin dark-shaded. Hind wing blackish fuscous. Expanse, male 29 mm., female 25 mm.

*Type.*—Male, selected from three males, 15 females, No. 16440, U.S.N.M.; Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

A rather large frail species, looking like *Poena*, but with squarer, broader wings.

**POENA PORRECTALIS** Guenée.

10. Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek and C. P. Crafts).

**LEPTOCTENISTA DUBIA Warren.**

7. Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

Three males appear typical; the four others (2 males and 2 females) are darker, less distinctly marked, and may not be the same.

**LEPTOCTENISTA sp.**

4. La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

Smaller and lighter than *L. dubia*, the female with much ocher at base of hind wing. Possibly another species, but it seems unsafe to name it.

**GALANDA FUNEREA Warren.**

3. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

All in poor condition, as is likewise my single named specimen (from Costa Rica, identified by Schaus). This seems extremely close to *Leptoctenista dubia*, and possibly is that species. The material is too poor for certainty.

**REJECTARIA PHARUSALIS Walker.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

**SCOPIFERA NIACISALIS Walker.**

2. Porto Bello, March, 1911, and April, 1912 (Busck).

**MELINA HIRTIPALPIS Walker.**

3. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**PTEROPRISTA ALBIPUNCTALIS Druce.**

5. Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**MÆRODES COLOMBALIS Guenée.**

1. Cabima, May, 1911 (Busck).

**ATOPOMORPHA SINGULARIS Warren.**

1. Porto Bello, May, 1912 (Busck).

**MASTIGOPHORUS LYSIZONA Druce.**

5. Trinidad River, March, 1912 (Busck); Porto Bello, February, 1911 and April, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**MEGACHYTA PRIASSALIS Walker.**

24. Porto Bello, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**BLEPTINA CARADRINALIS Guenée.**

37. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, June, 1912 (Busck), and July, 1912 (J. Zetek, C. P. Crafts).

The series runs smaller than one from the United States before me and has more tendency to have black points before the subterminal line, but seems inseparable specifically.

**PALTHIS SUBMARGINATA Schaus.**

2. Trinidad River, March and June, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**PALTHIS INCURIOSA, new species.**

Similar to *P. submarginalis* Schaus, but smaller, browner, the middle line of fore wing strongly bent as well as the outer line. Hind wing stained with dark brown on middle of outer margin, the lines normal, not crowded toward the margin in the female. Male with the middle legs not modified, smooth, tibiæ with one long and one short end spurs. Expanse, male, 15 mm.; female, 18–21 mm.

*Cotypes.*—One male, two females, No. 15945, U.S.N.M.; Corozal, Canal Zone, July, 1912 (J. Zetek), male; (C. P. Crafts) female; Trinidad River, March, 1912 (Busck), female.

**HYPENA LEUCTRA Druce.**

2. Cabima, May, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**HYPENA PACIFICA Walker.**

6. Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

## COLA, new genus.

Fore wings with veins 7–10 stalked, 11 from cell; hind wing with 3–4 shortly stalked, 5 very slightly depressed at base; frons without prominence; thorax and abdomen without crests; proboscis rather weak but distinct; palpi oblique, the second joint long, blade-like, compressed, fringed with scales above, the third long, pointed.

*Type of the genus.*—*Cola nabis*, new species.

**COLA NABIS, new species.**

Fore wing dark brown, densely powdered over an ocherous ground; outer margin centrally darker shaded; two minute black dots in cell; outer line slender, dark, with slight pale outer edge, straight, bent at right angles in its upper third. Hind wing blackish fuscous. Expanse, 12 mm.

*Cotypes.*—Two specimens, No. 15896, U.S.N.M., selected from a series of thirteen; Porto Bello, February, 1911 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

## HOPOTHIA, new genus.

Frons without prominence; tongue well developed; palpi upturned, second joint slightly thickened with scales in front, third smooth, rather long; vestiture scaly; abdomen without crests. Fore wing with veins 2–3 shortly stalked, running close together, 4–5 arising close together and divergent near margin, veins 2-5 thickened on their basal three-fourths, 6 below angle of cell, 7-10 stalked, 7 arising before 9, 11 from cell, free, straight. Hind wing with 3-4 from angle of cell, 5 below middle of cross-vein, 6-7 from apex of cell, 8 anastomosing with cell nearly to middle.

*Type of the genus.*—*Hopothia histigma*, new species.

**HOPOTHIA HISTIGMA, new species.**

Fore wing light carneous brown, with a few scattered irrorations or groups of scales of dark brown; a small rounded dark brown spot on middle of costa. Hind wing pale fuscous, irrorated with scattered single dark brown scales. Expanse, 13 mm.

*Cotypes.*—Two males, No. 15906, U.S.N.M.; Taboga Island, February, 1912 (Busck); La Chorrera, May, 1912 (Busck).

## CRAMBOPHILIA, new genus.

Fore wing with veins 7-10 stalked, 11 from the cell, free. Hind wing with 3-4 shortly stalked, 8 anastomosing with the cell near base only, 4 slightly depressed at base. Frons without prominence; thorax and abdomen without crests; proboscis moderately well developed; palpi upturned, the second joint reaching vertex with slight fringe of scales in front, third short, blunt, smooth.

*Type of the genus.*—*Crambophilia majorcula*, new species.

**CRAMBOPHILIA MAJORCULA, new species.**

Fore wing long, the margins subparallel, sordid brownish gray, becoming brown on the margin, the irrorations denser; base of costa dark brown; a row of terminal brown dots continued around apex; a group of brown scales for discal dot and scattered others representing the outer line, bent outward beyond cell. Hind wing dark fuscous. Expanse, 10-11 mm.

*Cotypes.*—Three specimens, No. 15902, U.S.N.M.; Porto Bello, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**CRAMBOPHILIA MINORCULA, new species.**

Fore wing straw color; a broad ocher shade in center of wing, not reaching costa; terminal brown dots continued around apex and two more near middle of costa; scattered brown irrorations in and below cell and some scales representing the outer line. Hind wing faintly irrorated with brown, shaded with ocher in cell. Expanse, 9.5 mm.

*Cotypes.*—Four specimens, No. 15903 U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

## TINEOCEPHALA, new genus.

Fore wing with veins 7-10 stalked, 11 free; hind wing with 3-4 stalked, 8 anastomosing with the cell near base only; frons without prominence; thorax and abdomen without crests; proboscis moderately well developed. Palpi upturned, the second joint long with fringe of scales on front side, third joint long, pointed, naked. Scales of head long and abundant, curving smoothly over to join those of thorax.

*Type of the genus.*—*Tineocephala judis*, new species.

**TINEOCEPHALA JUDIS, new species.**

Fore wing long, narrow, the margins subparallel; sordid ocherous, dusted with gray, the margin and fringe shaded with this color; a minute distinct black discal spot; costa black at base, with alternating dark and pale specks outwardly; outer line obsolescent, dark, powdery, forming a right angle in its upper third. Hind wing sordid whitish, darker on the margin. Expanse, 12 mm.

*Cotypes.*—Four specimens, No. 15901, U.S.N.M.; La Chorrera, May, 1912 (Busck).

## Family LASIOCAMPIDÆ.

**PRORIFRONS CASTULLUX, new species.**

Blackish brown; lines indistinct, straight, pale, four, slender, whitish, all converging slightly on inner margin and a little bent on costa; discal dot a minute white speck; subterminal line wavy, macular, pale, obsolescent; two small black specks above tornus. Hind wing with pale straight mesial shade and outer curved one. Expanse, 80 mm.

*Cotypes.*—Two males, No. 15946, U.S.N.M.; Cabima, May, 1911, (Busck); La Chorrera, May, 1912 (Busck).

Similar to *P. quadrilineta* Barnes and McDunnough, but darker, larger, the lines less convergent, the markings less distinct. Apparently a derivative of *P. peruviana* Druce, but the markings much less distinct.

**PRORIFRONS ANTONIA Schaus.**

2. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**TOLYPE NANA Druce.**

6. Trinidad River, March and June, 1912 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**TOLYPE MEXICANA Herrich-Schäffer.**

1. La Chorrera, May, 1912 (Busck).

A female, the median lines strongly approximated.

**TOLYPE TARUDA Schaus.**

1. Porto Bello, February, 1911 (Busck).

**TOLYPE SYNŒCURA Dyar.**

2. Empire, Canal Zone (D. D. Gaillard).

Bred from a pod-shaped communal nest pendant from a branch.

**ARTACE PUNCTISTRIGA Walker.**

2. Porto Bello, March ,1911 (Busck); Cabima, May, 1911 (Busck).

**CLAPHE MARIA Schaus.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

**CLAPHE MELANCHOLICA Butler.**

1 Trinidad River, March, 1912 (Busck).

**CLAPHE CARAMINA Schaus.**

1. Alhajuelo, April, 1911 (Busck).

**CLAPHE SUBMARGINALIS Walker.**

3. Trinidad River, March, 1912 (Busck).

**CLAPHE SOBRINA Schaus.**

1. Corozal, Canal Zone, April, 1912 (Busck).

**CLAPHE CHARAX Druce.**

1. Trinidad River, March, 1912 (Busck).

**CLAPHE DISCORICA, new species.**

Brown, the basal space suffused with black; median lines slender, black, approximate, wavy, parallel, inclosing a narrow whitish median space and large oval discal black spot; lines duplicated, the inner by a waved shaded line within, the outer by a narrow line without; subterminal line waved, faint, shaded, submacular; terminal pale dots preceded by a dusky line. Hind wing with costo-apical quadrate white patch and mesial straight dark line. Expanse, 25 mm.

*Type.*—Male No. 15947, U.S.N.M.; Taboga Island, February, 1912 (Busck).

Near *C. obtusa* Herrich-Schäffer, but the median space narrower and whiter, the lines more distinct and strongly duplicated.

**CLAPHE VITTABUNDA, new species.**

Thorax and inner margin of fore wing violet-brown; the rest of the wing clay-brown, irrorated with red-brown, forming four lines of strigæ on outer half; dark area along inner margin occupies the base, becomes narrow centrally and widens to a quadrate patch on tornus. Hind wing reddish brown suffused, showing only clay-colored inceptions of wavy lines on costa. Expanse, 36 mm.

*Type.*—Male No. 15948, U.S.N.M.; Cabima, May, 1911 (Busck).

Colors of *C. marna* Schaus from Brazil, but with pattern and size of *C. lankesteri* Schaus from Costa Rica.

**OCHA LIBNITES Druce.**

1. Porto Bello, February, 1911 (Busck).

## Family LIPARIDÆ.

**CAVIRIA TIBIALIS Walker.**

4. Corozal, Canal Zone, March, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

Provisionally listed under this name. The three from Corozal have the fore wing shaded with brown, especially over disk. The one from Alhajuelo is all white. There may be two species represented, both distinct from *tibialis*, but the condition of the material is too poor to make the specimens into types.

**MANTRUDA CHIRONOMUS Dyar.**

1. Trinidad River, March, 1912 (Busck).

Pale brown, rather than the chocolate brown of typical *chironomus* from the Guianas, but with the same markings.

**MANTRUDA ERRATICA Schaus.**

2. Trinidad River, March, 1912 (Busck).

**TROCHUDA PURA Walker.**

1. Porto Bello, April, 1912 (Busck).

**PACHYPLASTIS APICALIS Felder.**

1. Trinidad River, March, 1912 (Busck).

## Family NOTODONTIDÆ.

**CALLEDEMA MARMOREA Butler.**

3. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**CALLEDEMA JOCASTA Schaus.**

1. La Chorrera, May, 1912 (Busck).

**MARTHULA RUFESCENS Schaus.**

4. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Porto Bello, April, 1912 (Busck).

**PHEDOSIA TURBIDA Möschler.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

*Proelymiotis apicenotata* Dognin[1] is a synonym of this.

**NYSTALEA PLUMIPES Schaus.**

6. Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**NYSTALEA NYSEUS Cramer.**

1. Trinidad River, March, 1912 (Busck).

**NYSTALEA LOPHOCERA, new species.**

Male antennæ with bristles and cilia, the apical third thickened, curved and bearing rufous hair, tips simple. Wings narrow, the costa expanded near base. Pattern of markings of *guttulana* Schaus, *plumipes* Schaus, and *forfex* Dognin, gray with blotches of green; basal area brown shaded on costa; a row of black dots in the cell and blackish blotches on inner margin; inner line distinct, double excurved in cell, slightly dentate; outer line obsolete, very faintly indicated in brown; a minute black discal dot and some blotches in submedian space; a blackish subapical band on costa; subterminal line black, slender, a little irregular only, sharply drawn in below vein 2. Hind wing grayish brown, paler just at base. Legs with long hairs. Abdomen without lateral tufts. Expanse, 44 mm.

*Cotypes.*—Two males, No. 15949, U.S.N.M.; Trinidad River, March, 1912 (Busck).

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[1] Ann. Ent. Soc. Belg., vol. 53, 1909, p. 75.

**LYSANA PLUSIANA** Schaus.

1. Trinidad River, March, 1912 (Busck).

**PENTOBOSA XYLINOIDES** Walker.

3. Paraiso, Canal Zone, January, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**ELYMIOTIS PURPURASCENS** Butler.

1. Trinidad River, June, 1912 (Busck).

**ERAGISA GARLEPPI** Druce.

2. Cabima, May, 1911 (Busck).

*E. sabulosa* Schaus is a synonym of this.

**CRINODES STRIOLATA** Schaus.

1. Cabima, May, 1911 (Busck).

**CRINODES RITSEMÆ** Butler.

1. Paraiso, Canal Zone, June, 1911 (Busck).

**LIRIMIRIS TRUNCATA** Herrich-Schaffer.

2. La Chorrera, May, 1912 (Busck).

**LEPASTA MIXTA** Möschler.

1. Cabima, May, 1911 (Busck).

**DIDUGUA ARGENTILINEA** Druce.

1. Corozal, Canal Zone, July, 1912 (J. Zetek).

**BETOLA AROATA** Schaus.

1. Cabima, May, 1911 (Busck).

The true *aroata* has the hind wings of the male narrowly nearly pure white.[1]

**DRUGERA MORONA** Druce.

3. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**CERURA RARATA** Walker.

1. Trinidad River, May, 1911 (Busck).

**CERURA LAQUEATA** Schaus.

2. Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**CERURA LANCEA** Schaus.

4. Cabima, May, 1911 (Busck).

**CERURA DANDON** Druce.

1. Trinidad River, May, 1911 (Busck).

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[1] Two other species were confused with *aroata* in the collection. They may be designated as follows:

**BETOLA DENSISSIMA, new species.**

Male antennæ bipectinate on basal half. Fore wing with the markings finer and more densely crowded than in *aroata*, the costa not darkly shaded; pale subcostomedial area not contrasted, without a distinct, pale ray to apex; central ray at vein 5 divided by a double brown streak. Hind wing fuscous tinged, especially on the veins, inner margin, and terminally. Expanse, 43 mm.

*Cotypes.*—Four males, No. 15950, U.S.N.M.; St. Jean, Maroni River, French Guiana, May, 1904 (W. Schaus); Geldersland, Surinam River, Dutch Guiana (W. Schaus); Omai, British Guiana (W. Schaus).

**BETOLA APOSTATICA, new species.**

Male antennæ subserrate and fasciculate. Fore wing with the markings coarse, broad, and open; central clay-colored area running from base to apex as in *aroata*, washed with red-brown, not olive as in *aroata*; no pale ray at apex; ray at vein 5 reduced to a streak with an angled mark above. Hind wing fuscous tinged, especially on inner and outer margins; veins dark. Expanse, 45 mm.

*Cotypes.*—Four males, No. 15951, U.S.N.M.; Rio Potaro, British Guiana (W. J. Kaye); Omai, British Guiana (W. Schaus); St. Jean, Maroni River, French Guiana, July, 1904 (W. Schaus).

**HETEROCAMPA NOTABILIS Schaus.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**HETEROCAMPA LÆCA Schaus.**

1. La Chorrera, May, 1912 (Busck).

**HETEROCAMPA PUNCTATA Druce.**

2. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, June, 1912 (Busck).

**HETEROCAMPA TUNA Schaus.**

3. Paraiso, Canal Zone, January and February, 1911 (Busck); Porto Bello, April, 1912 (Busck).

The Porto Bello specimen is a male, agreeing with the type from Colombia, but small. The two females from Paraiso are darkly suffused, showing only a trace of the mesial light marking; but as the female of *tuna* was heretofore unknown, this may be the normal marking of that sex.

**HETEROCAMPA VIRIDESCENS Walker.**

1. Cabima, May, 1911 (Busck).

**HETEROCAMPA LOPODITES, new species.**

Blackish and brown, a little green tinted especially along costa. Inner line white, angular, showing a sharp zigzag next to inner margin, within which is a basal ocherous ray, edged with black below; discal mark brown with reddish field; outer line geminate, reddish filled, becoming white above inner margin; subterminal spots black. Hind wing with costal edge gray, crossed by a waved pale line; discal area more or less pale; fuscous shaded with linear terminal line. Expanse, 33–37 mm.

*Cotypes*. Three males, No. 15952, U.S.N.M.; Paraiso, Canal Zone, Panama, January, 1911 (A. Busck); Tuis, Costa Rica, June, 1907 (W. Schaus); Sixola River, Costa Rica, March, 1907 (W. Schaus).

Allied to *H. proba* Schaus, less green and with distinctive markings on inner margin. Mr. Schaus did not make a positive determination of this species. He evidently recognized it as distinct, but did not wish to describe it.

**MASCHANE ERRATIPENNIS Walker.**

1. Alhajuelo, April, 1911 (Busck).

**RHUDA FOCULA Cramer.**

1. Cabima, May, 1911 (Busck).

**MALOCAMPA MATRALIS Schaus.**

1. Corozal, Canal Zone, April, 1911 (Busck).

**BLERA TENUIS Schaus.**

1. Trinidad River, March, 1912 (Busck).

**RIFARGIA DISTINGUENDA Walker.**

22. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

**RIFARGIA MYCONOS Schaus.**

5. Paraiso, Canal Zone, January and February, 1911 (Busck); Porto Bello, February, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**RIFARGIA PRESBYTICA, new species.**

Light gray; at base of fore wing a curved black streak stained with brown from base to inner margin at inner line; inner line double, curved, dentate, cutting off a dark gray-filled blotch on costa; reniform constricted, with an inner appendage above; outer line double, stained with brown, lunulate, followed by a row of round black blotches, encircled by gray and clouded without the line from costa subapically and approximate to outer line below; subterminal linear, black, dislocated into segments above and projected on the veins below. Hind wing whitish at base, dark fuscous without; fringe white. Expanse, 42 mm.

*Cotypes.*—Three females, No. 15953, U.S.N.M.; Taboga Island, Panama, February, 1912 (A. Busck); Sixola River, Costa Rica, August, 1907 (W. Schaus).

Closely allied to *R. prærupta* Dognin from French Guiana, which, however, lacks the basal arc and has the hind wing less whitish at base. The Sixola River specimen is marked "*R. condita* Schs. fide B. M." but I can not associate it with the male type of *condita,* of which we have no female. The Tuis specimen is marked "*myconos* Schs. ♀" but the type of *myconos* from Peru is a female and clearly distinct.

**NAVARCOSTES LIMNATIS Schaus.**

1. Cabima, May, 1911 (Busck).

**NAPREPA CYLLOTA Druce.**

1. Cabima, May, 1911 (Busck).

**NAPREPA FLEXIFERA Schaus.**

2. La Chorrera, May, 1912 (Busck).

**NAPREPA PULCHERIA Druce.**

1. Cabima, May, 1911 (Busck).

**HEMICERAS FLAVESCENS Schaus.**

1. Porto Bello, February, 1911 (Busck).

**HEMICERAS OLEAGINA Dognin.**

1. Porto Bello, February, 1911 (Busck).

**HEMICERAS PLANA Butler.**

1. Cabima, May, 1911 (Busck).

**HEMICERAS VECINA Schaus.**

1. Porto Bello, March, 1911 (Busck).

**HEMICERAS CLARKI Schaus.**

1. Cabima, May, 1911 (Busck).

The type of *clarki* is a male with large black discal spots. The present specimen agrees, but the discal spots are smaller and more approximate. Not so small, however, as in the female *clarki* labeled by Mr. Schaus.

**HEMICERAS COREMA** Schaus.

1. La Chorrera, May, 1912 (Busck).

**HEMICERAS DEORNATA** Walker.

2. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**HEMICERAS RUFESCENS** Walker.

3. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**HEMICERAS EVANESCENS** Dyar.

1. Tabernilla, Canal Zone, May, 1907 (Busck), the female type.

**HEMICERAS INDISTANS** Guenée.

1. Trinidad River, March, 1912 (Busck).

**APOLA DIVISA** Walker.

1. Cabima, May, 1911 (Busck).

**CHILARA MONETA** Felder.

1. La Chorrera, May, 1912 (Busck).

**ANTÆA LICORMAS** Cramer.

1. La Chorrera, May, 1912 (Busck).

**ANTÆA JUTURNA** Cramer.

1. Trinidad River, March, 1912 (Busck).

**APATELODES LAPITHA** Druce.

2. Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**OLCECLOSTERA AMORIA** Druce.

1. Alhajuelo, April, 1911 (Busck).

**ZANOLA VERAGO** Cramer.

2. Corozal, Canal Zone, March, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**TAMPHANA MARMOREA** Schaus.

1. Trinidad River, March, 1912 (Busck).

**CARTHARA SURYNORTA** Schaus.

2. Porto Bello, March, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**ROSEMA DEOLIS** Cramer.

1. Trinidad River, March, 1912 (Busck).

**ROSEMA ACIRITES** Druce.

2. La Chorrera, May, 1912 (Busck).

**ROSEMA FULVIPENNIS** Butler.

1. Cabima, May, 1911 (Busck).

Very close to *R. marona* Schaus, which has small discal spots, lacking here. *R. falcata* Schaus from Bolivia [1] is also allied but larger, with the wings more pointed. Druce has duplicated the name *Rosema falcata*,[2] and his species, if different, will have to be renamed.

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[1] Proc. U. S. Nat. Mus., vol. 29, 1905, p. 294.

[2] Ann. Mag. Nat. Hist. (8), vol. 7, 1911, p. 292.

## Family BOMBYCIDÆ.

**COLLA CŒLESTIS Schaus.**

1. Trinidad River, March, 1912.

## Family GEOMETRIDÆ.

### Subfamily HYDRIOMENINÆ.

**HAMMAPTERA COLUMBARIA Dognin.**

2. La Chorrera, May, 1912 (Busck); Trinidad River, March, 1912 (Busck).

**HAMMAPTERA MINNIPENNA, new species.**

Fore wing green (faded to ocher); costa narrowly black; subbasal line slender, arcuate, followed by a broad green (ocher) space; inner line a broad band of blackish; outer line slender, crenulate, with inward points on the veins, the median space partly divided with blackish; subterminal line faint, shaded over the subterminal space, sharp and denticulate without; terminal space narrow, clear. Hind wing dark fuscous gray, fringes whitish. Expanse, 17–19 mm.

*Cotypes.*—Two females, No. 16954, U.S.N.M.; Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**DYSPTERIS TRIFILARIA Walker.**

1. Trinidad River, March, 1912 (Busck).

**DYSPTERIS AMATA Cramer.**

4. Trinidad River, March, 1912 (Busck); Taboga Island, February, 1912 (Busck).

**LEPTIDULE ANTITHESIS, new species.**

Entirely reddish ocher; the male with a large patch of raised ocher scales on underside of fore wing from lower part of cell and origin of vein 3 over vein 1; a similar patch on upper side of hind wing (covering the first when the wings are closed) from subcostal vein to lower edge of cell. Antennæ blackish. Expanse, male, 28 mm.; female, 22–30 mm.

*Cotypes.*—Male and female, No. 15955, U.S.N.M.; the female selected from a series of 19, La Chorrera, May, 1912 (Busck); others from Cabima, May, 1911 (Busck).

**DOCHEPHORA FUMOSA Warren.**

2. Cabima, May, 1911 (Busck).

### Subfamily HEMITHIINÆ.

**TACHYPHYLE OLEASTER Schaus.**

1. La Chorrera, May, 1912 (Busck).

**TACHYPHYLE MAIESTER, new species.**

Fore wing rather strongly falcate; dark green, the apex red-brown, the extreme costa and tip black; some blackish freckles along costal half; discal dot rounded, purplish; outer line only present, broad, purplish over white, joining the costa near apex. Hind wing long drawn out at anal angle, green, with a single line like that of fore wing, slightly beyond the minute discal dot. Expanse, 27 mm.

*Type.*—Male, No. 16054, U.S.N.M.; Porto Bello, April, 1912 (Busck).

**TACHYPHYLE OUBRICA, new species.**

Green, the markings faint; discal dots minute, black; outer line pale, dark within, much as in *bryata* Felder. Hind wing with a large square light purple patch at anal angle, reaching from outer line to margin. Expanse, 22 mm.

*Type.*—Male, No. 16055, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**PHRUDOCENTRA PUPILLATA Warren.**

6. Trinidad River. March, 1912 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**DICHORDA OBLIQUATA Warren.**

3. Taboga Island, February, 1912 (Busck); Paraiso, Canal Zone, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**RACHEOSPILA OCELLATA Stoll.**

21. Taboga Island, January, 1911 (Busck); Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**RACHEOSPILA ATRAPES Druce.**

1. Trinidad River, March, 1912 (Busck).

**RACHEOSPILA INTENSA Warren=EXPULSATA Walker.**

6. Trinidad River, March, 1912 (Busck); Porto Bello, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**RACHEOSPILA ATURIA Druce.**

1. Corozal, Canal Zone, March, 1911 (Busck).

**RACHEOSPILA SIGILLARIA Guenée.**

3. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); Porto Bello, May, 1911 (Busck).

**RACHEOSPILA CONCINNARIA Schaus.**

1. Trinidad River, March, 1912 (Busck).

**RACHEOSPILA DELICATESCENS, new species.**

Translucent pale green; discal dot minute, black on fore wing, double and white on hind wing; each wing with a narrow marginal border of pale purple, blotched with white, widened at vein 5 and tornus. Abdomen purplish dorsally with purple crests, metallic at their sides. Expanse, 24 mm.

*Type.*—Female, No. 16056, U.S.N.M.; Porto Bello, March, 1911 (Busck).

**RACHEOSPILA AGENORIA Schaus.**

1. Trinidad River, March, 1912 (Busck).

**RACHEOSPILA ALBOCILIARIA Herrich-Schäffer.**

3. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**PYROCHLORA RHANIS Cramer.**

7. Trinidad River, March, 1912, and June (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**CHLORINTHIS PULCHERRIMA Butler.**

1. Cabima, May, 1911 (Busck).

**SYNCHLORA FRONDARIA Guenée.**

2. Cabima, May, 1911 (Busck).

**MIANTONOTA CARBINA Druce.**

1. Taboga Island, February, 1912 (Busck).

**OÖSPILA ROSIPARA Warren.**

1. La Chorrera, May, 1912 (Busck).

**DRYADOPSIS ADJUNCTARIA, new species.**

Similar to *D. pulveraria* Schaus, smaller, the discal mark closely approximated to the inner line; costa less broadly strigose in brown; submarginal row of dots punctiform on both wings. Expanse, 24 mm.

*Type.*—Male, No. 16057, U.S.N.M.; Trinidad River. March, 1912 (Busck).

**TACHYCHLORA LEPIDARIA Möschler.**

2. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**NEGATHIA COMPTATA Felder.**

1. Trinidad River, March, 1912 (Busck).

**RACHEOLOPHA SARPTARIA Möschler.**

1. Trinidad River, March, 1912 (Busck).

**HYDATA CADUCATA Felder.**

1. Trinidad River, June, 1912 (Busck).

Very close to a specimen from Costa Rica identified by Schaus, but small.

**CHLOROPTERYX PRODUCTARIA Herrich-Schäffer.**

2. Corozal, Canal Zone, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**CHLOROPTERYX HYPERYTHRARIA Guenée.**

2. La Chorrera, May, 1912 (Busck).

**CHLOROPTERYX SUBRUFESCARIA Warren.**

3. Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**CHLOROPTERYX ALBIDATA Warren.**

7. Porto Bello, March, 1911 (Busck); Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

### Subfamily ACIDALIINÆ.

**HETEREPHYRA SEMIBRUNNEA Warren.**

1. Trinidad River, March, 1912 (Busck).

**HETEREPHYRA ILLIMITATA Warren.**

1. Taboga Island, February, 1912 (Busck).

**HETEREPHYRA PUNCTATA Stoll.**

5. Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

Also two large specimens, Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**HETEREPHYRA CUNEIFERA Warren.**

1. Trinidad River, March, 1912 (Busck).

**HETEREPHYRA NALTONA Schaus.**

1. Corozal, Canal Zone, July, 1912 (J. Zetek).

**DICHROMATOPODIA CERVINA Warren.**

2. Taboga Island, February, 1912, and June, 1911 (Busck).

**ANISODES DISPERGARIA Möschler.**

3. Porto Bello, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, April, 1911 (Busck).

**ANISODES CANDARA Druce.**

1. Cabima, May, 1911 (Busck).

**ANISODES RUFICOSTA Warren.**

1. Trinidad River, March, 1912 (Busck).

**CNEMODES INDIGNARIA Guenée.**

2. La Chorrera, May, 1912 (Busck).

**CRASPEDIA UMBILICATA Guenée.**

39. Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck), July, 1912 (Busck, J. Zetek, C. P. Crafts); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**IDÆA OSSULARIA Hübner.**

22. Porto Bello, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); La Chorrera, April, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck), July, 1912 (J. Zetek).

A small, depauperate form as compared with United States specimens. The three males from Taboga Island are better developed.

**IDÆA SUBQUADRATA Guenée.**

22. Paraiso, Canal Zone, February, 1911 (Busck); Cabima, May, 1911 (Busck); Porto Bello, May, 1912 (Busck); La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**IDÆA ASOPIATA Guenée.**

6. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**IDÆA IMPROPRIATA Walker.**

45. Cabima, May, 1911 (Busck); Trinidad River, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**IDÆA LANCEOLESCENS, new species.**

Fore wing narrow, pointed, the outer margin oblique; creamy brown with narrow whitish lines, obscure, the submarginal coarsely waved. Lines still fainter on hind wing. Discal dots on both wings round, black, distinct, though small. Expanse, 8–10 mm.

*Cotypes.*—Three females, No. 16070, U.S.N.M.; Taboga Island, February, 1912 (Busck).

**IDÆA COSTIFERA, new species.**

Creamy whitish; costa of fore wing distinctly brown on the basal half, fading outwardly; fore wing with three slender brown lines, irregularly and slightly wavy, the outer and submarginal both excurved a little on the discal venules, the submarginal also excurved on subcostal venules; slight brown irrorations in terminal space; a terminal brown line; discal dot small, brown. Hind wing with two lines, the inner running through the discal dot, the outer similar to that on fore wing. Expanse, male 16 mm., female 18 mm. The lines in the male are narrower than in the female and somewhat broken.

*Cotypes.*—Male and female, No. 16071, U.S.N.M; Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck). Also six, with additional localities Alhajuelo, April, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**"PYRINIA" DETRACTARIA Walker.**

1. Alhajuelo, April, 1911 (Busck).

This species does not belong to *Pyrinia*, which genus falls in another subfamily.

**LIGONIA EXQUISITATA Möschler.**

1. Cabima, May, 1911 (Busck).

**ASELLODES LATERUARIA Guenée.**

2. Taboga Island, February, 1912, and June, 1911 (Busck).

**TRYGODES MERTA Druce.**

1. Taboga Island, February, 1912 (Busck).

**DITHADAMA ANGULATA Schaus.**

2. Cabima, May, 1911 (Busck).

**DITHADAMA DELILA Schaus.**

3. Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1911 (J. Zetek).

**EUMACRODES (EUACIDALIA) ORBELIA Druce.**

5. Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**CAMBOGIA HELIDARIA Guenée.**

1. Cabima, May, 1911 (Busck).

**CAMBOGIA TEGULARIA Guenée.**

1. Alhajuelo, April, 1911 (Busck).

**CAMBOGIA HULAQUINA, new species.**

Nearest to *undulosata* Warren; but without the black discal points and the central shade; yellow, with many wavy purple lines, the median one heavy and angled; no blackish shadings. Expanse, 19 mm.

*Type.*—Female, No. 16059, U.S.N.M.; Cabima, May, 1911 (Busck).

**LIPOMELIA DIVARICATA Warren.**

2. Cabima, May, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck).

**EOIS RUSSEARIA Hübner.**

1. Taboga Island, June, 1911 (Busck).

**EOIS QUADRIRUBATA Warren.**

1. Trinidad River, March, 1912 (Busck).

**HYRIA GAVISATA Walker.**

6. Trinidad River, March and June, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**HYRIA RADIARIA Schaus.**

1. La Chorrera, May, 1912 (Busck).

**HYRIA FLEXILINEA Warren.**

2. Trinidad River, March, 1912 (Busck); Porto Bello, April, 1912 (Busck).

**HYRIA RUBIDENTATA Warren.**

4. Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**HYRIA HELLERIA Schaus.**

11. Porto Bello, March, 1912 (Busck); Corozal, Canal Zone, April, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

Schaus's type is a female. The male has the fore wing pointed; pale yellow with round black discal dot; a rounded purple patch on inner margin rising close to cell; slight powderings beyond the discal dot. Hind wing with the costal half rust-brown; a wide pale yellow vacuole below the discal dot; anal area broadly purple; a little yellow at apex.

**HYRIA ROSINARIA Schaus.**

2. Cabima, May, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**HYRIA GEMMA Schaus.**

1. La Chorrera, May, 1912 (Busck).

Differs slightly from the types from Mexico, but scarcely to a specific degree.

**HYRIA PAULESCA, new species.**

Fore wing whitish-purple, frosted, margin yellow, broader subcostally and at tornus, shaded, a little pinkish at the joining of the colors. Hind wing purple, with even central curved yellow band and narrow yellow margin, shading to pinkish as on fore wing. Expanse, 9 mm.

*Type.*—No. 16060, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also nine others with additional localities Taboga Island, February, 1912 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**HYRIA CROCEIMARGINATA Schaus.**

1. Trinidad River, May, 1912 (Busck).

More violaceous, less deep purple than Schaus's type from Costa Rica, but otherwise the same.

**TRICENTRA COLLIGATA Warren.**

7. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

The red is less uniform than in the type of Warren, the marginal markings being often more or less deep purple; but a separate name is possibly not necessary at present.

**CALYPTOCOME IGNIFER Warren.**

11. Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts.)

**CALYPTOCOME RIVULARIA Dyar.**

11. Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**CALYPTOCOME SUBRUBELLA Warren.**

2. Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek).

**CALYPTOCOME CONCOLORARIA Dognin.**

1. La Chorrera, May, 1912 (Busck).

**CALYPTOCOME PTYCTOGRAPHA Dyar.**

1. Taboga Island, June, 1911 (Busck).

**CALYPTOCOME CATAGOMPHA Dyar.**

1. Porto Bello, April, 1912 (Busck).

**NEOSTERICHA THETIS Warren.**

1. Cabima, May, 1911 (Busck).

**DEPTALIA INSULARIA Guenée.**

1. Corozal, Canal Zone, April, 1911 (Busck).

**HEMIPTILOTA RUDIMENTARIA Guenée.**

25. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1911 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrara, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**HAEMALEA PULLIDA Dognin.**

1. Trinidad River, March, 1912 (Busck).

**HAEMALEA TERMINATA Guenée.**

13. Porto Bello, February, 1912 (Busck); Corozal, Canal Zone, July, August, and November, 1912 (C. P. Crafts).

**HAEMALEA CRUORATA Warren (=OLMIA Druce).**

24. Porto Bello, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**HAEMALEA STRAMINEA Warren.**

1. Trinidad River, March, 1912 (Busck).

**HAEMALEA MACOARIA Schaus.**

2. Taboga Island, February, 1912 (Busck).

**HAEMALEA MACOUMA Schaus.**

4. Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**PAMMERIS EURIOPIS, new species.**

Fore wing yellow over the disk and margin, costa broadly pale purple, basal two-thirds of inner margin broadly dark purple. Hind wing with a large white discal patch, black edged, the disk salmon pink with fine dentate black line; submarginal area purple; margin rather broadly yellow. Expanse, 13 mm.

*Type.*—Male, No. 16064, U.S.N.M.; Alhajuelo, April, 1911 (Busck).

Near *P. albigutta* Warren, but the white spot on hind wing much larger.

**PTYCHOPODA ZOALMA, new species.**

Purple, frosted with whitish; costa whitish; margin broadly orange brown, shaded to deeper before the purple; fore wing with a purple discal dot and two outer lines, close together and joining on inner margin. Hind wing with a wavy line across the disk and another farther out, the ground deep purple just before the red border. Expanse, 11 mm.

*Type.*—No. 16058, U.S.N.M.; Porto Bello, May, 1912 (Busck). Also a worn specimen from Jalapa, Mexico (Schaus collection).

Close to *P. flavicincta* Warren, but more washed with whitish.

**PTYCHOPODA ADIPATA Schaus.**

19. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912, and May, 1911 (Busck); Porto Bello, April, 1911 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**PTYCHOPODA HORRIFICA Warren.**

8. Porto Bello, April, 1912 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Paraiso, Canal Zone, June, 1911 (Busck).

**PTYCHOPODA FINITA Warren.**

2. Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

*Ptychopoda muscifasciata* Warren is another name for the female.

**PTYCHOPODA CEDRICA, new species.**

*Male.*—Wings squarish; mid tibiæ without hair-pencil; fore wing with pencil of long hairs arising from a short lobe on middle of inner margin below and extending to anal angle, its tip covering an oval fovea. Straw-color, the margin purplish to outer line, which is dark and irregular; discal dot minute; two shaded marks on costa; all the marks faint and not contrasted. Expanse, 9 mm.

*Female.*—Wings more pointed; markings the same but more distinct, discal dot and broad purple border, reaching almost to the edge, but little vacuolated with straw-color on the margin, limited within by the darker, more purplish line, which is slightly irregular; two faint marks on costa; no marginal dots. Expanse, 10 mm.

*Cotypes.*—Male and female, No. 16061, U.S.N.M.; Taboga Island, June, 1911 (Busck). Also 9 males and 25 females, all from Taboga Island except 1 male and 2 females, which are from Cabima, May, 1911 (Busck), and Corozal, Canal Zone, April, 1911 (Busck), July, 1912 (J. Zetek).

**PTYCHOPODA ONCA Druce.**

1. Porto Bello, April, 1912 (Busck).

**PTYCHOPODA SUBCRINITA Schaus.**

7. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**PTYCHOPODA UMBRIMARGO, new species.**

Male with a hair-tuft on the mid tibiæ, which are short and have one very long spur and one short one; fore wing simple. Brownish straw-color, irrorate with purple; discal dots black; outer line evenly curved, scarcely at all irregular, the marginal space filled in with purplish except along the apex and tornus, where it is pale; a row of terminal black dashes; fringe pale. Expanse, 11 mm.

*Cotypes.*—Male and female, No. 16062, U.S.N.M.; Cabima, May, 1911 (Busck). Also 1 male and 23 females, La Chorrera, May, 1912 (Busck); Paraiso, Canal Zone, January, 1911 (Busck); Trinidad River, June, 1912 (Busck); Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck).

Close to *P. onca* Druce, female, but the outer line is more parallel to the margin, making the marginal purple area more uniform and broader at tornus. Differs from *P. subcrinita* Schaus, female, in the even outer line.

**PTYCHOPODA VAGATA Warren.**

1. Trinidad River, March, 1912 (Busck).

**PTYCHOPODA SINCERIO, new species.**

Male with a hair-tuft at base of middle femur and large one on tibia; a tuft covering the base of the small hind leg. Hind wing small, oval, with but one anal vein close to the margin. Pale straw-color, the margin broadly purplish, limited by the irregular outer line, vacuolated on the termen; a row of terminal dashes. Hind wing with the outer half purplish, a little mottled. Expanse, 11 mm.

*Type.*—Male, No. 16065, U.S.N.M.; La Chorrera, May, 1912 (Busck)

Two females, which I have tentatively associated, closely resemble *P. cedrica* cited above, but are rather darker; Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**PTYCHOPODA CLOTHULA, new species.**

Straw-color, irrorate with red-brown; inner line distinct, straight, the base more or less purple-shaded; discal dot minute; outer line rather near the margin, inbent on submedian; margin purple-shaded, broadly pale at apex. Hind wing similar, the margin less distinctly purple-shaded; a finely broken terminal line. Male without hair-tufts on the legs, the hind legs slender and complete, though small. Expanse, male, 10 mm.; female, 11 mm.

*Cotypes.*—Male and female, No. 16066, U.S.N.M.; Corozal, Canal Zone, April, 1911 (Busck). Also 10 males and 3 females, Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Paraiso, Canal Zone, April, 1911 (Busck); Trinidad River, May, 1911 (Busck); Porto Bello, May, 1912 (Busck); La Chorrera, May, 1912 (Busck).

Allied to *rufarenaria* Warren.

**GONIACIDALIA BALMATA, new species.**

Uniformly purplish, evenly irrorated; discal dot large; outer line crenulate. Hind wing notched on the margin, the anal angle lobed and distorted; a groove in the center of the wing above containing orange hairs. Expanse, 12 mm.

*Type.*—Male, No. 16063, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also four other males, Corozal, Canal Zone, March, 1911 (Busck); La Chorrera, May, 1912 (Busck).

Like *G. furciferata* Packard, but smaller and darker. Some of the females cited under *P. umbrimargo* above may appertain to this species. Accurate association of the sexes is difficult.

**DEINOPYGIA FALCIPENNIS Warren.**

1. Taboga Island, February, 1912 (Busck).

**DEINOPYGIA CONIFER Warren.**

20. Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); La Chorrera, April and May, 1912 (Busck); Cabima, May, 1911 (Busck).

**DEINOPYGIA TRIANGULATA Warren.**

2. Corozal, Canal Zone, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**DEINOPYGIA RECTIFACIENS, new species.**

Pale straw-color, the margins faintly purple tinted; fore wing acute, with scattered irrorations; discal dot minute; an outer rather broad purplish band, bent out a little over the discal nervules; terminal dots around apex and to the middle of outer margin. Hind wing similar, but the band preceding the discal dot is straight, running to inner margin above tornus. Male with yellow hairs along inner area of hind wing below. Expanse, 11–12 mm.

*Cotypes.*—Two males, No. 16067, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Near *D. caudata* Warren, but the hind wing squarer, less pointed at tornus.

**DEINOPYGIA GOSPERA, new species.**

Similar to the preceding, the wings more rounded, less acute; hind wing rounded, outer margin scarcely excavate, anal angle not at all tailed; below in the male with yellow hairs along inner margin. Band of fore wing more upright, more bent, indistinctly attaining the costa; terminal dots all along the margin. Lines of hind wing slenderer, linear, less oblique. The female is similar, but the band on hind wing is broad. Expanse, male, 10 mm.; female, 11 mm.

*Cotypes.*—Male and female, No. 16068, U.S.N.M.; Taboga Island, February, 1912 (Busck), and Porto Bello, April, 1912 (Busck). Also 3 males and 2 females, Alhajuelo, April, 1911 (Busck); La Chorrera, April and May, 1912 (Busck).

## Subfamily ENNOMINÆ.

**OPOISTHOXIA MOLPODIA Druce.**

1. Cabima, May, 1911 (Busck).

**OPISTHOXIA NITIDISQUAMA Warren.**

2. Cabima, May, 1911 (Busck).

**OPISTHOXIA FORMOSANTE Cramer.**

5. Trinidad River, March, 1912 (Busck).

Agrees with *formosante* from Surinam above, but below washed with white. Cramer says of *formosante* that the underside is violet or bluish white. It is possible that the species varies in this respect, hence I do not propose a name for the present form.

**OPHTHALMOPHORA PHRYNEARIA Schaus.**

4. Porto Bello, March, 1911 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**PHRYGIONIS PALLICOSTA Felder.**

1. Porto Bello, April, 1912 (Busck).

**APLOGOMPHA CHOTARIA Schaus.**

7. Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**APLOGOMPHA ANGUSTA, new species.**

Close to *A. costimacula* Warren, the markings being essentially the same, but the fore wing of the male long and narrow, hind wing moderate, not broadly expanded, while the basal two-thirds of both wings below are washed with yellowish. Female pale brown above, but with the markings of the male on both sides. Expanse, male, 23 mm.; female, 21 mm.

*Cotypes.*—Male and female, No. 16072, U.S.N.M.; Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

For the determination of *A. costimacula* I depend upon a specimen from Costa Rica labeled by Mr. Schaus. The female from French Guiana before me labeled by Mr. Warren agrees perfectly with the male type of *A. argentilinea* Schaus. The female type of *argentilinea* has lost the pale spot of hind wing on both surfaces.

**CHRYSOCESTIS FIMBRIARIA Cramer.**

10. Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**BERBERODES CAMPYLOPHLEPS, new species.**

*Male.*—Hind wing with the margin produced at veins 1–2, vein 1 bent and running along close to the margin of the lobe, the membrane full and distorted. White, translucent, fore wing brown shaded along costa and margin and with three bands of quadrate metallic yellowish spots. Hind wing with the margin brown, the expanded area purplish shaded; three rows of spots above vein 2 as on fore wing. Expanse, 27 mm.

*Type.*—Male, No. 16073, U.S.N.M.; Corozal, Canal Zone, April, 1911 (Busck).

Nearest to *B. cassotius* Warren.

**BERBERODES IMPURA, new species.**

*Male.*—Wings without modification; white, the lines obscure; median space of both wings stained with metallic ocher, on fore wing not attaining the costa and defining a white discal streak; costa freckled with black; terminal area grayish, irrorate, with a black speck at vein 6 of fore wing; terminal dots small. Beneath, translucent white with rather broad brown-black border on both wings; fringe pale, tinged with brown. Expanse, 19 mm.

*Type.*—Male, No. 16074, U.S.N.M.; Cabima, May, 1911 (Busck).

**SEMIOTHISA ACCUMULATA Guenée.**

3. Porto Bello, February, 1911 (Busck); Paraiso, Canal Zone, February, 1911 (Busck).

**SEMIOTHISA ORBONATA Guenée.**

1. Cabima, May, 1911 (Busck).

**SEMIOTHISA CARDINEA Druce.**

2. Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**SEMIOTHISA ENOTATA Guenée.**

9. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**SEMIOTHISA CARPO Druce.**

9. La Chorrera, May, 1912 (Busck).

**SEMIOTHISA ARENISA Dognin.**

3. Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**SEMIOTHISA INFUSATA Guenée.**

2. Corozal, Canal Zone, July, 1912 (J. Zetek).

**SEMIOTHISA SANTAREMARIA Walker.**

6. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**SEMIOTHISA NIGROPUNCTATA Warren.**

5. Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**SEMIOTHISA DIFFUSATA Guenée.**

2. Corozal, Canal Zone, July, 1912 (J. Zetek).

**SEMIOTHISA PALLIDATA Warren.**

5. Corozal, Canal Zone, July, 1912 (J. Zetek).

**SEMIOTHISA ACHETATA Guenée.**

1. Porto Bello, February, 1911 (Busck).

**SEMIOTHISA JOSEFARIA Schaus.**

4. La Chorrera, May, 1912 (Busck).

Differing in several respects, but so close that I do not like to separate it at present.

**SEMIOTHISA BEJUCOARIA, new species.**

Very close to S. *occultata* Warren, darker, more densely and uniformly irrorate; submarginal straight band broad, farther out; median band broader and more evident. Hind wing densely irrorate, the line preceding the discal dot broadened with shading. Expanse, 29–30 mm.

*Cotypes.*—Two females, No. 16076, U.S.N.M.; Bejuco River (W. Schaus).

**SEMIOTHISA PERPENDICULATA Guenée.**

1. Bugaba (W. Schaus).

**UREPIONE QUADRILINEATA Walker.**

2. La Chorrera, May, 1912 (Busck).

**NEMATOCAMPA RETICULATA Butler.**

1. Trinidad River, March, 1912 (Busck).

**TETRACIS ATROPUNCTARIA Walker.**

3. Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, May, 1912 (Busck).

**METANEMA ANOPSIARIA Guenée.**

11. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**MYCHONIA EXCISA Warren.**

1. Cabima, May, 1911 (Busck).

**APICIA NYPARIA Walker.**

1. La Chorrera, May, 1912 (Busck).

**APICIA EXERRARIA Guenée.**

4. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**APICIA ALTERARIA Guenée.**

18. Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek), November, 1912 (C. P. Crafts).

**APICIA DISTYCHARIA Guenée.**

4. Paraiso, Canal Zone, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**RHOMBOPTILA BRANTSIATA Schaus.**

2. Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**PATALENE HAMULATA Guenée.**

6. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**HALESA ÆNITUSALIS Walker.**

3. Cabima, May, 1911 (Busck).

**EUSARCA SUBFASCIATA Warren.**

2. La Chorrera, May, 1912 (Busck).

**CLETA MINUTA Druce.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**CLETA FARAGITA Schaus.**

1. Alhajuelo, April, 1911 (Busck).

**DREPANODES DREPANULA Hübner.**

3. Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck).

**OXYDIA SIXOLA Schaus.**

1. Trinidad River, March, 1912 (Busck).

**OXYDIA TRANSCENDENS Walker.**

1. Cabima, May, 1911 (Busck).

**PARAGONIA TASMIA Cramer.**

1. Cabima, May, 1911 (Busck).

**AESCHROPTERYX TETRAGONATA Guenée.**

1. Trinidad River, March, 1912 (Busck).

**THYSANOPYGA APICITRUNCARIA Herrich-Schäffer.**

13. Taboga Island, January, 1911 (Busck); Trinidad River, March and June, 1912 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, May, 1912 (Busck).

**AZELINA RUMINA Druce.**

1. Cabima, May, 1911 (Busck).

**AZELINA LIGNATA Warren.**

6. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 and May, 1911 (Busck); Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**AZELINA DORSIPUNCTATA Warren.**

2. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**AZELINA SOLITARIA Schaus.**

1. La Chorrera, May, 1912 (Busck).

**AZELINA STOLIDATA Guenée.**

3. Corozal, Canal Zone, March, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**PERGANA POLYGONARIA Herrich-Schäffer.**

1. Porto Bello, March, 1912 (Busck).

**CATOPYRRHA DECREPITARIA Hübner.**

6. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, March and June, 1912 (Busck).

**CASBIA OROANDA Druce.**

2. Corozal, Canal Zone, July, 1912 (J. Zetek).

**CASBIA NICETARIA Guenée.**

2. Trinidad River, March, 1912 (Busck).

**CASBIA PALLIDICOSTA Warren.**

1. Tabago Island, February, 1912 (Busck).

**CYCLOMIA STRIGIFERA Warren.**

25. Alhajuelo, April, 1911 (Busck); Corozal, Canal Zone, April, 1911 (Busck), July, 1912 (J. Zetek, C. P. Crafts); La Chorrera, May, 1912 (Busck); Paraiso, Canal Zone, June, 1911 (Busck).

**CYCLOMIA FULVIMACULA Warren.**

1. Trinidad River, June, 1912 (Busck).

**CYCLOMIA OCELLATA Warren.**

1. Taboga Island, June, 1911 (Busck).

**ISCHNOPTERIS RASTELLARIA Felder.**

2. Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**GENUSA VICINA Schaus.**

1. Taboga Island, February, 1912 (Busck).

**AMPHIDASYS ARNOBIA Cramer.**

4. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, May, 1912 (Busck); Trinidad River, June, 1911 (Busck).

**GAZENA CATAMELAS Kaye.**

1. Cabima, May, 1911 (Busck).

**PHYSOCLEORA NUBILATA Warren.**

26. Taboga Island, February, 1911 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**PHYSOCLEORA CAMERATA Warren.**

1. Trinidad River, March, 1912 (Busck).

**PHYSOCLEORA CAPRUMA Schaus.**

2. Paraiso, Canal Zone, February, 1911 (Busck).

Not agreeing very well with the type from Brazil, but both specimens in bad condition, unfit to describe.

**PHYSOCLEORA PUSILLA Warren.**

6. Trinidad River, March, 1912, and May, 1911 (Busck); Cabima, May, 1911 (Busck).

**CATORIA UNIPENNARIA Guenée.**

2. Porto Bello, April, 1911 (Busck).

**CATORIA THARPOIDES Thierry-Mieg.**

3. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**ALCIS PANDROSOS Schaus.**

4. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck).

**ALCIS DELICATA Butler.**

1. Trinidad River, June, 1912 (Busck).

**ALCIS PLENARIA Walker.**

2. Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck).

**ALCIS UMBELLULARIA Hübner.**

1. Taboga Island, February, 1912 (Busck).

**EPIMECIS FRATERNARIA Guenée.**

2. Paraiso, Canal Zone, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**EPIMECIS SUBALBIDA Warren.**

1. Porto Bello, April, 1912 (Busck).

**TORNOS PENUMBROSA, new species.**

*Female.*—Heavily shaded with black, especially over margin of fore wing and all of hind wing except costa; lines obscure, the outer traceable, denticulate; apex and center of wing brown; costa blackish shaded; discal spot large, raised; subterminal line white, pulverulent punctiform. A black discal dot on hind wing and traces of whitish subterminal line. Expanse, 23 mm.

*Type.*—Female, No. 16075, U.S.N.M.; La Chorrera, May, 1912 (Busck).

This is possibly a dark variety of *T. quadripunctata* Warren (=*punctata* Druce), but I think more likely distinct. Mr. Schaus obtained a similar specimen in Costa Rica (Sixola River, March, 1907).

**ASTYOCHIA FAULA Druce.**

1. Cabima, May, 1911 (Busck).

### Subfamily OENOCHROMINÆ.

**HEDYLE HELICONARIA Guenée.**

6. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Trinidad River, March 1912 (Busck); La Chorrera, May, 1912 (Busck).

**ZANCLOPTERYX SUBSIMILIS Warren.**

2. Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**ZANCLOPTERYX UNIFERATA Walker.**

1. Trinidad River, March, 1912 (Busck).

**ACHLORA CŒNOBIATA Felder.**

1. Trinidad River, June, 1912 (Busck).

## Family DIOPTIDÆ.

**JOSIA FULVIA Linnæus.**

8. Tabernilla, Canal Zone, May, 1907 (Busck); Corozal, Canal Zone, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**ACTEA BRYCE Walker.**

8. Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**EPHIALTIAS PSEUDENA Boisduval.**

6. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**SCOTURA LEUCOPHLEPS Warren.**

5. Trinidad River, March and June, 1912 (Busck); La Chorerra, May, 1912 (Busck).

**ZUNACETHA BIPARTITA Walker.**

2. Trinidad River, June, 1912 (Busck).

**PHÆOCHLÆNA TENDINOSA Hübner.**

1. Trinidad River, March, 1912 (Busck).

**TITHRAUSTES HÆMON Druce.**

1. Trinidad River, March, 1912 (Busck).

## Family URANIIDÆ.

**URANIA FULGENS Walker.**

3. Ancon, Canal Zone (O. Celestine), "very numerous in April" (B. G. Ireneo).

**MANIA EMPEDOCLES Cramer.**

1. Trinidad River, March, 1912 (Busck).

**MANIA LUNUS Linnæus.**

1. Porto Bello, March, 1911 (Busck).

## Family EPIPLEMIDÆ.

**NEDUSIA PLACIDARIA Walker.**

1. Corozal, Canal Zone, July, 1912 (J. Zetek).

**ANTIPLECTA CINERASCENS Warren.**

1. Alhajuelo, April, 1911 (Busck).

## Superfamily TINEOIDEA.

## Family NOLIDÆ.

**RŒSELIA BIFILIFERATA Walker.**

5. Trinidad River, March and June, 1912 (Busck).

**RŒSELIA POLYODONTA Schaus.**

3. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck).

**RŒSELIA PERNITENS Schaus.**

3. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**RŒSELIA MESOGRAPHA Schaus.**

3. La Chorrera, May, 1912 (Busck).

In these specimens the median band is nearly absent, leaving only a large costal spot. The species was described as a *Nola,* but I find vein 9 to be present, though very short.

**RŒSELIA PEDANTA Dyar.**

7. Trinidad River, March and June, 1912 (Busck).

**RŒSELIA PECTA, new species.**

Whitish gray, slightly irrorate; a rounded triangular black-brown spot in the middle of the costa; inner line brown, slightly curved; outer line wavy, gently excurved from vein 2 to vein 6, preceded below by some brown spots; subterminal line blackish, irregular; some brown shading on the margin on the lower half. Hind wing faintly fuscous tinged outwardly, with cloudy gray discal dot and marginal line. Expanse, 15 mm.

*Cotypes.*—Two males, No. 16077, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**RŒSELIA HYPOPECTA, new species.**

Whitish gray; a square black blotch on the middle of costa reaching down to median vein; a wavy median line just beyond it and close to the outer line, which is slender, straight, running obliquely between veins 6 to 2; subterminal line wavy, shaded, blackish, followed by brown except at apex, the brown ending in dark terminal points. Hind wing pale fuscous. Expanse, 13 mm.

*Type.*—Female, No. 16078, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**RŒSELIA MICROPECTA, new species.**

Pale gray; fore wing with a triangular dark gray blotch on costa at middle; lines slender, blackish, the outer excurved over cell; termen gray shaded, the subterminal line wavy, a little darker than the shading; costa finely speckled with gray and white. Hind wing pale fuscous, uniform, discal dot darker. Expanse, 10 mm.

*Cotypes.*—One male, two females, No. 16079, U.S.N.M.; La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**RŒSELIA MELLETES, new species.**

Fore wing whitish, the margin broadly shaded with gray irrorations, not compact nor defined; inner line angled outwardly subcostally, irregular, broken; outer line smooth, black, regularly excurved opposite cell, doubled below; subterminal line black, dentate, mixed in the terminal shading; a row of terminal black dots alternating with spots in the fringe. Hind wing fuscous outwardly, pale at base; discal dot darker. Expanse, 16–18 mm.

*Cotypes.*—One male, three females, No. 16080, U.S.N.M.; Cabima, May, 1911 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**RŒSELIA ATYPICA, new species.**

Whitish, rather coarsely irrorate with blackish; a dark spot on base of costa; inner line shaded, curved; outer line oblique to costa, bordering a dark oblique patch, then curved around parallel to margin; subterminal line regular and even, parallel to margin, finely denticulate; the gray irrorations denser on the margin. Hind wing pale, fuscous tinged along veins and margin. Expanse, 15 mm.

*Type.*—Male, No. 16081, U.S.N.M.; Cabima, May, 1911 (Busck).

**NOLA ÆSCHYNTELA, new species.**

Pale gray with black irrorations in clusters; inner line slender, curved, irregular; outer line dotted, excurved over cell and less so below, preceded by a black shade throughout, but most distinct below with red-brown shading on margin and tornus; subterminal line spotted and diffused, blackish; margin darkly irrorate. Hind wing fuscous, pale at base; discal dot darker. Expanse, 14 mm.

*Cotypes.*—Two females, No. 16083, U.S.N.M.; Trinidad River, March and June, 1912 (Busck). Also one male and six females with additional localities, La Chorrera, May, 1912 (Busck); Paraiso, Canal Zone, January, 1911 (Busck).

**NOLA BRUNNEIFERA, new species.**

Similar to the preceding, but the lines lost in a black irrorate shade that replaces the outer line and its duplication and runs along costa to base, forming streaks on the veins; brown marking on inner margin to tornus distinct; terminal markings reduced to irrorations. Hind wing pale, with more fuscous margin. Expanse, 12 mm.

*Cotypes.*—Two males, No. 16084, U.S.N.M.; La Chorrera, May, 1912 (Busck).

Possibly this is the male of *æschyntela*, of which the single male cited as paratype is badly rubbed.

**NOLA NEPHELEPASA, new species.**

Pale gray, the markings nearly obliterated; an aggregation of dark scales near middle of costa entering the cell; a few specks for outer line; subterminal line a waved cloud. Hind wing gray, pale at base; no trace of discal dot. Expanse, 15 mm.

*Type.*—Female, No. 16085, U.S.N.M.; Corozal, Canal Zone, April, 1911 (Busck).

**NOLA CHAUNA, new species.**

Whitish, broadly gray on the margin, cut by the whitish sinuate subterminal line and narrowly separated below from the slender, powdery, blackish outer line, which forms two smooth arcs; costa shaded with brown, broadening out beyond base and forming a larger patch beyond middle; a few dots toward apex. Hind wing fuscous tinged, most strongly so outwardly, the veins darker. Veins 7–10 stalked, 9 absent, 11 straight. Expanse, 9 mm.

*Cotypes.*—Three males, No. 16086, U.S.N.M.; Cabima, May, 1911 (Busck); Alhajuelo, April, 1911 (Busck).

Near *N. artata* Schaus from Costa Rica, but the costal patch is longer and more outwardly oblique.

**NOLA NIMBIMARGO, new species.**

Similar to *chauna*, the marginal clouding blacker; subterminal line obscure; outer line powdery, denticulate, not smooth; costal band distinct on basal two-thirds, enlarged into a small patch at the end. Hind wing translucent fuscous. Expanse, 12 mm.

*Type.*—Female, No. 16093, U.S.N.M.; Cabima, May, 1911 (Busck).

More like *artata* in costal marking than *chauna* is, but the outer line does not form a prominent coarse tooth on submedian as in *artata*.

I have also placed here two females in poor condition from La Chorrera, May, 1912 (Busck), and Trinidad River, March, 1912 (Busck).

**NOLA PROTHYMA, new species.**

Whitish, the margin gray and with a roundedly irregular, clouded submarginal line; a spot at base of costa; inner line coarse and dentate, obsolete below; a triangular costal, median, brown mark, from which a straight line runs across the wing; outer line slender, powdery, and a little broken, forming an arc above and a small one below. Hind wing pale fuscous, darker outwardly and on fringe. Expanse, 10 mm.

*Cotypes.*—Male and female, No. 16087, U.S.N.M.; La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck).

**NOLA QUINTESSA, new species.**

Pale gray, irrorate, the irrorations a little denser at the margin; subterminal shade rather remote, clouded, undulate on its outer margin; outer line nearly straight, oblique, shaded, and powdery, outbent a little in the middle; inner line broad, shaded, subparallel to the outer and likewise oblique. Hind wing pale gray; no discal dot. Expanse, 13 mm.

*Type.*—Female, No. 16091, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck).

Allied to *N. apera* Druce, but the outer line not forming points on the veins.

**NOLA ZETECI, new species.**

Blackish gray, dark, the fore wing narrow, its margins subparallel; a dark blotch at base and a large one near middle of costa, clouded and diffused across the wing; outer line oblique, dotted on the veins; subterminal somewhat dotted, obscure; a row of terminal black dots. Hind wing pale with fuscous margin and discal dot. Expanse, 14 mm.

*Type.*—Male, No. 16090, U.S.N.M.; Corozal, Canal Zone, July, 1912 (J. Zetek).

**NOLA CONTORTA, new species.**

Pale gray; costa pale brown, forming two spots close together, one between the raised stigmatal scales, the other just beyond; lines faint, blackish, broken; inner line waved and with duplicating patches within; outer broadly excurved above, with parallel browner shadings; subterminal line brownish, shaded, forming an arc above and a broader one over discal venules. Hind wing uniformly pale fuscous with darker discal dot. Expanse, 16 mm.

On fore wing the stalk of veins 7–10 (9 absent) is bent downward and vein 11 bent in the opposite direction at base.

*Type.*—Female, No. 16094, U.S.N.M.; Trinidad River, June, 1912 (Busck).

**NOLA FLAVESCENS, new species.**

Fore wing washed with pale yellow from base to outer line, with black irrorations and a central shade in place of inner line; costa pale brownish with two inconspicuous expansions; outer line blackish, distinct, smooth, evenly excurved above; terminal area pale gray, clouded with darker gray next the outer line and termen; subterminal line sinuate, denticulate, narrow, dark. Hind wing fuscous, paler at base; no discal dot. Expanse, 16 mm.

*Type.*—Female, No. 16095, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**NOLA HABROPHYES, new species.**

Head and thorax pure white. Base of fore wing white, with dark brown basal costal spot; terminal two-thirds of wing black-brown, bounded by an upright, straight edge; black area with scattered dark and silvery blue scales; a faint pale, smooth outer line visible, excurved over cell; some pale scales before the apex. Hind wing blackish gray; discal dot darker. Expanse, 13 mm.

*Type.*—Female, No. 16082, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**CELAMA SORGHIELLA Riley.**

10. Corozal, Canal Zone, July, 1912 (J. Zetek), August, 1912 (C. P. Crafts).

**CELAMA SYLPHA, new species.**

Whitish, rather sparsely irrorate, the general tone soft pale gray; costa with small brown-gray spot at base, a shaded one at inception of inner line and large slightly oblique one beyond middle; lines slender, brown-gray; inner line irregular; mesial also irregular and arising from the outer costal patch; outer line slender, gently excurved above; subterminal line clouded, forming three arcs; some dark scales on margin. Hind wing pale grayish, darker on the margin: no discal dot. Expanse, 11–13 mm.

*Cotypes.*—Male and female, No. 16096, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also 14 others with additional localities Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Taboga Island, February, 1912 (Busck).

Three out of the sixteen specimens retain vein 8 in the fore wing and would therefore be referable to *Nola,* if this were not evidently a case of variation.

## Family COCHLIDIIDÆ.

**EUCLEA NORBA** Druce.

10. Porto Bello, March, 1912 (Busck); Trinidad River, March, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, June, 1912 (Busck); Bejuco River (W. Schaus).

**EUCLEA BUSCKI** Dyar.

7. Cabima, May, 1911 (Busck); Trinidad River, May, 1911 (Busck).

**EUCLEA BARANDA** Schaus.

1. Bejuco River (W. Schaus).

**EUCLEA TRICHATHDOTA** Dyar.

1. Bejuco River (W. Schaus).

**METRAGA PERPLEXA** Walker.

5. Tabernilla, Canal Zone, May, 1907 (Busck); Corozal, Canal Zone, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**METRAGA COLLE** Dyar.

8. La Chorrera, May, 1912 (Busck).

This is, perhaps, only a variety of the preceding species.

**METRAGA EMILIA** Dyar.

2. Tabernilla, Canal Zone, May, 1907 (Busck); Bejuco River (W. Schaus).

**METRAGA RUBICOLOR** Dyar.

6. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Porto Bello, April, 1912 (Busck); Bejuco River (W. Schaus).

**SEMYRA BELLA** Herrich-Schäffer.

1. Porto Bello, May, 1912 (Busck).

**SEMYRA GLADYS,** new species.

Size and markings of *S. distincta* Möschler, but a shaded red patch below the cell subbasally, the silvery line and dark spot of *distincta* wholly lacking. Expanse, 28 mm.

*Type.*—Male, No. 16088, U.S.N.M.; Porto Bello, February, 1911 (Busck).

**TALIMA STRAMINEA** Schaus.

1. Bejuco River (W. Schaus).

**SISYROSEA DIANA** Druce.

2. Cabima, May, 1911 (Busck).

**SISYROSEA (?) PARVA Dyar.**

1. Alhajuelo, April, 1911 (Busck).

**SISYROSEA (?) APHASIA, new species.**

Close to *S.* (?) *phara* Druce, but the outer line more curved above, meeting the costa obliquely, and the hind wing lighter brown, about the color of the terminal space of fore wing.

*Type.*—Female, No. 16089, U.S.N.M.; Bejuco River (W. Schaus).

**EUPROSTERNA ELÆASA Dyar.**

7. Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, April, 1912 (Busck); Taboga Island, June, 1911 (Busck); Bejuco River (W. Schaus).

**NATADA SALTA Druce. (=FUSCA Druce).**

13. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Bejuco River (W. Schaus).

**NATADA NINDLA Dyar.**

2. Cabima, May, 1911 (Busck); Trinidad River, May, 1911 (Busck).

**EPIPEROLA ALBIMARGINATA Kaye.**

4. Trinidad River, March and June, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**EPIPEROLA PAIDA Dyar.**

1. Trinidad River, May, 1911 (Busck).

**EPIPEROLA VAFERA Druce.**

1. Cabima, May, 1911 (Busck).

**EPIPEROLA MONOCHROMA Dyar.**

5. Paraiso, Canal Zone, January, 1911 (Busck); Chiriquicito, April, 1906 (W. Schaus); Bocas del Toro, April, 1906 (W. Schaus).

Busck's specimen is darker than the others, being almost brown in color, but of the same size and without markings.

**PEROLA VILLOSIPES Walker.**

1. Cabima, May, 1911 (Busck).

**VIPSOPHOBETRON MARONA Dyar.**

2. Trinidad River, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

### Family MEGALOPYGIDÆ.

**MICRORAPE MINUTA Druce.**

12. Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**NORAPE PURA Butler.**

24. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**NORAPE XANTHOLOPHA, new species.**

White; fore wing without appressed lines, costa white below; front and vertex yellow; pectus and fore femora black; basal tuft of abdomen yellow. Expanse, 35 mm.

*Type.*—Male, No. 16092, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**TROSIA FALLAX Felder.**

1. La Chorrera, May, 1912 (Busck).

**TROSIA TRICOLORA Fabricius.**

6. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**TROSIA ARGENTEA Druce.**

1. Cabima, May, 1911 (Busck).

I have the name from Mr. Schaus, but have been unable to find the original description.

**TROSIA ACCA RIBBEI Druce.**

2. Trinidad River, March, 1912 (Busck); Porto Bello, April, 1912 (Busck).

The type of *acca* Schaus is from Mexico. Specimens from Costa Rica and Panama have the hind wing less orange, the fore wing grayer, and may perhaps hold the name *ribbei* Druce as a varietal one.

**TROSIA TYMPANIA Druce.**

1. Arajan, March, 1911 (Busck).

I placed this species in *Malmis*,[1] but find the venation of hind wing varies, veins 3 and 4 being either shortly stalked or separate.

**ARCHYLUS GUTTIFASCIA Walker.**

1. Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**MESOSCIA ERIOPHORA Sepp.**

1. Porto Bello, April, 1912 (Busck).

**MEGALOPYGE COSTARICENSIS Schaus.**

6. Trinidad River, March, 1912, and May, 1911 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**MEGALOPYGE LANATA Stoll.**

Panama City, April, 1911, larvæ on shade trees (Busck); larvæ on "Cashew tree" Ancon, Canal Zone, June, 1913 (E. M. Keyser).

No adults were captured, but the larvæ apparently commonly observed. The larva is well figured by Sepp,[2] under the name *Phalæna citri*.

**MEGALOPYGE ALBICOLLIS Walker.**

4. Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck); Porto Bello, May, 1912 (Busck).

**MEGALOPYGE MULTICOLLIS Schaus.**

3. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

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[1] Proc. Ent. Soc. Wash., vol. 12, 1910, p. 168.

[2] Surin. Vlind., vol. 1, 1830, p. 31, pl. 12.

### UNDUZIA, new genus.

Fore wing with veins 2–5 well separated, 6 arising below the angle of the cell 7–8 stalked, 9, 10, 11 on the cell, 12 free. Hind wing with 2 to 5 well separated, 6, 7 separate, 8 from subcostal near end of cell; frenulum absent. Antennæ short and slight. Head small, retracted.

*Type of the genus.*—*Unduzia gistinda*, new species.

**UNDUZIA GISTINDA, new species.**[1]

Brown; wings thinly scaled, translucent; a subterminal row of faint yellowish spots between the veins of fore wing, appearing raised. Expanse, 36 mm.

*Cotypes.*—Two females, No. 16097, U.S.N.M.; Trinidad River, March, 1912 (Busck).

### Family DALCERIDÆ.

**ACRAGA CARETTA Dyar.**

1. Porto Bello, April, 1912 (Busck).

**ACRAGA CONDA Dyar.**

2. Trinidad River, March, 1912 (Busck).

**ACRAGA COA Schaus.**

5. Corozal, Canal Zone, November, 1912 (C. P. Crafts); Bugaba (W. Schaus).

**ANACRAGA PHILETERRA Schaus.**

3. La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**ANACRAGA DULCIOLA, new species.**

Fore wing brown; a yellow patch at base running out to middle of inner margin. Hind wing orange, shading to brown on the fringe. Expanse, 11 mm.

*Type.*—Male, No. 16099, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also another larger and darker specimen, Porto Bello, December, 1912 (G. F. Cleveland).

### CA, new genus.

Fore wing with veins 8 and 10 wanting, 9–11 long-stalked or coincident; no accessory cell. Hind wing with 3–4 shortly stalked, 5–7 well spaced, 8 broadly joined to cell.

*Type of the genus.*—*Ca anastigma*, new species.

**CA ANASTIGMA, new species.**

Fore wing light yellow; a wavy dirty olivaceous shade across inner third of wing; a similar submarginal shade, irregular, illy defined, touching the margin in places; discal dot small, round, black, placed up toward the costa; two minute black dots at apex. Hind wing whitish with faint yellow tint. Expanse, 11 mm.

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[1] Another species of this genus is before me from Venezuela. It may be described as—

**UNDUZIA PHAULE, new species.**

Lighter brown, the submarginal spots scarcely relieved. Veins 4–5 of fore wing are closer together, 9 is shortly stalked with 7–8; on hind wing 6–7 are connate. Expanse, 30 mm.

*Type.*—Female, No. 16098. U.S.N.M.; Merida, Venezuela (S. E. Briceno).

*Cotypes.*—Four males, No. 16100, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**PARACRAGA CYCLOPHERA, new species.**

Creamy white; fore wing shaded with brown faintly; lines joined to each other and detached from costa and inner margin, forming an elliptical ring, more pointed below than above, slender, brown; some groups of scales in its upper part; a dot on vein 1 near middle and terminal row of dots on the veins. Hind wing immaculate. Expanse, 20 mm.

*Cotypes.*—Two males, No. 16101, U.S.N.M.; Cabima, May, 1911 (Busck).

## Family LACOSOMIDÆ.

**MIMALLO AMILIA Stoll.**

1. Trinidad River, May, 1912 (Busck).

**PAMEA RUMINA Druce.**

1. Taboga Island, June, 1911 (Busck).

**CICINNUS LANTONA Schaus.**

3. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**CICINNUS SOLVENS, new species.**

*Male.*—Fore wing with the apex falcate; dark purple gray; lines blackish, the inner nearly straight across the wing, a little wavy; outer line angled between veins 7 and 8, crenulate on the veins; discal spot round, blackish; an orange shade from outer line to below pointed apex; margin a little blackish shaded. Hind wing irrorate with dark scales, especially outwardly; a single mesial line, bluntly bent at upper third, followed below by a clouded duplication. Expanse, 43 mm.

*Female.*—Wood brown; wings irrorated with purplish; lines as in the male, the outer followed below by a duplication in olive brown; duplication of line on hind wing olive-brown shaded. Expanse, 48 mm.

*Cotypes.*—Two males, one female, No. 16102, U.S.N.M.; Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**CICINNUS BETA Schaus.**

1. Trinidad River, March, 1912 (Busck).

## Family PSYCHIDÆ.

**PLATŒCETICUS APHAIDROPA, new species.**

Fore wing trigonate, hind wing rounded; brown, thinly scaled, with slight bronzy tint; veins of fore wing darker, the apex and margin a little more bronzy. Expanse, 19 mm.

*Type.*—No. 16110, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Venation as in *P. costaricensis* Schaus, except that vein 10 is stalked.

**PLATŒCETICUS SYMMICTA, new species.**

Fore wing broad with rounded apex; hind wing rounded trigonate; brown, unicolorous; hind wing a little lighter. Expanse, 12 mm.

*Type.*—No. 16111, U.S.N.M.; Ancon, Canal Zone (A. H. Jennings).

Veins 8–9 of fore wing stalked, 10 from cell; 4, 5 from a point in both wings.

**OIKETICUS KIRBYI Guilding.**

2. La Chorrera, April, 1912 (Busck).

## Family THYRIDIDÆ.

**DRACONIA RUSINA Druce.**

1. La Chorrera, May, 1912 (Busck).

**DYSODEA ANGULISOLA, new species.**

Fore wing dark purple-brown, nearly solidly from base to outer two-thirds, where it ends in a straight, oblique line; terminal area light yellow, finely irrorate with dark, apex shaded across to vein 7; a narrow band of dark brown from costa before apex, stopping at outer margin at middle; a small erect mark from tornus; basal dark area washed with light purplish in bands. Hind wing dark on costa fourth, the rest yellow, thickly reticulate with dark brown; a narrow transverse band near base; two small white-hyaline discal spots, the lower triangular; traces of two outer patches of dark, confused in the reticulations. Expanse, 26 mm.

*Type.*—No. 15535, U.S.N.M.; Cabima, May, 1911 (Busck).

Near *D. thyridina* Felder and Rogenhofer, possibly the same, in case their figure is in error in the details of the apical marking of fore wing.

**DYSODIA REMIE, new species.**

Brick red with broken, subreticulate dark lines; a round dark spot at outer third of costa, from which a straight narrow line runs to inner margin; a subterminal broken line, lost in reticulations; a faint clouding at apex and tornus. Hind wing with straight mesial line following two minute, white-hyaline discal dots; all of outer space faintly lilacine shaded over the reticular lines except a ray outward from cell. Expanse, 22 mm.

*Type.*—No. 15539, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**RHODONEURA THIASTORALIS Walker.**

1. Porto Bello, April, 1912 (Busck).

Agrees with a specimen from Ecuador so labeled in Mr. Schaus's writing. Specimens from Jamaica and Cuba labeled "*Pharambara thiastoralis* Walk. (=*violalis* Poey)" by Mr. Warren are larger, browner, and with the outer margin more prominent centrally, but perhaps not more than a race of the same species. Walker described *Pyralis thiastoralis* from Brazil.[1] Hampson gives it a very wide range, including the Neotropical region and Malayan subregion.[1] Specimens from Costa Rica collected by Mr. Schaus are all very much larger, but with the wing-shape of the Panama specimen.

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[1] Cat. Brit. Mus., Lep. Het., vol. 19, 1859, p. 898.

**RHODONEURA PAULLULA Pagenstecher.**

1. Tabernilla, Canal Zone, May, 1907 (Busck).

**RHODONEURA MESCEMEMNA, new species.**

Fore wing pointed at apex, a projection below middle of outer margin; hind wing with strong emargination below tip. Lilaceous with coarse black strigose dots in lines; apex minutely white with black dot; a square red discal mark with black dots at the corners; a broad outer red band, widening on costal half; terminal area reddish shaded; a dark subterminal line with blackish shade across it at the projection of the margin. Hind wing with the inner third shaded with black and red, cut across before middle by a reddish band, which runs sharply to margin below the emargination as a white ray. Expanse, 19 mm.

*Cotypes.*—Two specimens, No. 16105, U.S.N.M.; selected from a series of seven; La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck).

**RHODONEURA PAMMICRA, new species.**

Bronzy brown, reticulated with dark brown; two lines forming an outer band widening on costa, one distinct and straight; a similar subterminal line. Hind wing with heavier lines broadly reticulating over fine strigæ, inclosing a pale elliptical patch touching costa and one on tornus. Expanse, 14 mm.

*Type.*—No. 16106, U.S.N.M.; Taboga Island, June, 1911 (Busck).

**SICULODES POSTPONENS, new species.**

Ground color whitish; terminal half of fore wing overlaid with smoky violaceous; numerous strigose transverse bands of blackish gray, the five inner ones broken, the four outer ones more continuous and curved; a red shade beyond end of cell with black patch below it; a white speck at apex, containing a black dot. Hind wing broadly washed with whitish on inner area, the apex violaceous gray; a mesial gray band, heavily stained with purple-black centrally, resembling a discal spot. Expanse, 23–27 mm.

*Cotypes.*—Two specimens, No. 16107, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**BRIXIA MOLECULA, new species.**

Creamy white; head brown; fore wing with fine gray strigæ; a rounded gray patch at inner third centrally and a band at outer third, irregular, widening to costa; a red-brown band from costa before apex to vein 5, forked below; a short band a tornus. Hind wing with an inner gray narrow band; a broad mesial one, rounded off at vein 7 and narrowed at inner margin; a narrow uniform submarginal band stained with red-brown near the costa; fringes of both wings stained with red-brown. Expanse, 20 mm.

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[1] Proc. Zool. Soc. Lond., 1887, p. 620.

*Type.*—No. 16108, U.S.N.M.; Alhajuelo, April, 1911 (Busck).

**HERDONIA BRIXIFACIES, new species.**

Fore wing olive grayish with darker gray bands and irrorations; subbasal mark on costa; inner curved band incised centrally; outer band a spot on costa and band below, shaded and outbent over discal venules; subterminal band broken centrally, its costal segment shaded with red-brown, furcate below against a longitudinal row of black dots. Hind wing creamy white with brown bands; an inner spot; mesial band straight, furcate toward costa, its lower limb black; submarginal band broken at its upper third, with a black dot inward from the dislocation. Expanse, 17–22 mm.

*Cotypes.*—Two specimens, No. 16109, U.S.N.M.; La Chorrera, May, 1912 (Busck).

## Family PYRALIDÆ.

### Subfamily PYRAUSTINÆ.

**HOMOPHYSA INVISALIS Guenée.**

5. Corozal, Canal Zone, March and April, 1911 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**HOMOPHYSA CALLA Kaye.**

3. Porto Bello, April, 1912 (Busck); Trinidad River, May, 1911, and June, 1912 (Busck).

**HOMOPHYSA CYMALIS, new species.**

Fore wing white; yellow linear shadings over base and apex; median space white; lines soft purplish, clouded, the inner broadly double, the outer excurved, denticulate below, followed by a broad shade to the subterminal; a white terminal patch at end of veins 2–3, in which black terminal dots are seen, obsolete above and below. Hind wing whitish, a little clouded outwardly, the peculiar terminal marking faintly reproduced. Expanse, 15 mm.

*Type.*—Female, No. 16114, U.S.N.M.; Trinidad River, June, 1912 (Busck). Two others with additional data, Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

Allied to *H. polycyma* Hampson.

**HOMOPHYSA ORIOLA, new species.**

Brownish straw-color over white, the white showing in patches, which are especially large in the median space; lines white, edged by the dark color; inner line with outward angle on discal and submedian folds; outer line roundly excurved on upper two-thirds, bent on submedian; a fine terminal black line, forming a dot subcostally and on submedian, preceded narrowly by white. Hind wing whitish costally, shaded with brownish outwardly; a white line with dark inner edge, obsolete above and below; terminal line with black point on submedian. Expanse, 13 mm.

*Type.*—Female, No. 16113, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also 7 others with additional localities: Porto Bello, April, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Trinidad River, March and August, 1912 (Busck); Corozal, Canal Zone, November, 1912 (C. P. Crafts).

Near *H. sequistrialis* Hübner, the lines softer with edges concolorous with the wing-shades, the terminal line not uniform, etc.

**HOMOPHYSA MORIBUNDALIS, new species.**

Similar to *H. cymalis*, smaller, veins 10 and 11 of fore wing coincident. Base and termen shaded with olive yellow; inner line rigid, slightly curved; median space purplish, pale on the costa; a black shade on termen above the middle with a white patch below. Hind wing soiled whitish, with faint gray outer line. Expanse, 11 mm.

*Type.*—Female, No. 16214, U.S.N.M.; Corozal, Canal Zone, July, 1912 (J. Zetek). Also one female, Porto Bello, May, 1912 (Busck).

**MASSEPHA LUPA Druce.**

9. Trinidad River, March and June, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**NEUROPHYSETA MELLOGRAPTA, new species.**

White; discal mark blackish, quadrate, notched above and below; a wood-brown longitudinal shade on costa and one below; subbasal line black-brown; inner line far out, dentate on subcostal and median; a stripe along costa almost to inner line; a wood-brown half band below; outer line nearly straight above, bent in at right angles at vein 2, then again bent to inner margin; terminal space nearly filled by a black-brown band, parallel to the outer line, notched outwardly by white at discal and submedian folds; a terminal black line; fringe white, patched with black at apex and middle of outer margin. Hind wing with a band near the base, then clear white; median space filled with black-brown, except for a white ray out from the discal dot, straightly limited inwardly, outwardly by the bent outer line, which resembles that of fore wing, but is less sharply bent; termen as on fore wing. Expanse, 15 mm.

*Type.*—Female, No. 16116, U.S.N.M.; Trinidad River, June, 1912 (Busck). Another specimen from Alhajuelo, April, 1911 (Busck).

Close to *Musotima narcissusalis* Walker, as identified by Mr. Schaus in a specimen from Aroa, Venezuela, which, if correct, proves that *narcissusalis* should be removed from *Musotima*.

**PSEPHIS MINISTRALIS, new species.**

Soft brown over whitish, the lines showing white, their dark edges scarcely contrasted; subbasal line straight, a little oblique; inner line arcuate; outer line with a sharp central outcurve, almost angled; discal mark oblique, dark; a row of terminal black dots. Hind wing with single outer line, dark within, white without. Expanse, 10 mm.

*Type.*—Male, No. 16112, U.S.N.M.; Porto Bello, April, 1912 (Busck). Also 4 others with additional localities, Cabima, May, 1911 (Busck); Trinidad River, May, 1911 (Busck).

Allied to *P. myrmidonalis* Guenée, but the lines appear pale on a darker ground instead of the reverse.

**LIPOCOSMA PARCIPUNCTALIS, new species.**

Whitish; inner line far out, fulvous-gray, bent; outer line excurved above and angled outward on submedian; a brown shade at apex. Hind wing with a patch of dark scales representing the inner half of mesial band; a slender brown line curved over a patch of brown-gray on inner half of margin, containing four little black dots. Expanse, 11 mm.

*Type.*—Female, No. 16170, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck).

**LIPOCOSMA PUNCTISSIMALIS, new species.**

Fore wing with veins 4–5 stalked; heavily irrorate with black, leaving a triangular white patch at basal third of inner margin, extending up to cell; two black streaks on costa; a black discal mark; a heavy semicircular black and brown shade on costa outwardly, followed by the slender, curved outer line, which runs out near the margin, then in along vein 3 and is dentate on submedian; this is followed narrowly by black; tornus filled in with black; apex white with dotted terminal line. Hind wing with the margin twice incised; white at base and in the indentations of the outer line, else powdered with black; a black raised tuft below cell, followed by a dark area; a row of seven minute black dots with coppery scales on lower half of margin. Expanse, 10 mm.

*Type.*—Male, No. 16171, U.S.N.M.; Taboga Island, June, 1911 (Busck). Also four males and one female from the same place, February, 1912 (Busck).

Allied to *Ambia argyractalis* Schaus (which is not an *Ambia*), but much smaller and more diversified in markings. Also differing in venation, having veins 4 and 5 of fore wing stalked, while they are apart in *argyractalis*.

**LIPOCOSMA TELIFERALIS, new species.**

Similar to *L. punctissimalis* and with the same venation; fore wing whiter, the markings more open; a white area on costa; white triangle narrower and followed by fulvous brown. Hind wing without any conspicuous dark area below the cell-tuft which has long thick hairs nearly reaching the margin; incision of outer line sharp. Expanse, 10 mm.

*Type.*—Male, No. 16172, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also a female from Porto Bello, April, 1912 (Busck).

**LIPOCOSMA CONSORTALIS, new species.**

Fore wing creamy whitish at base with purple atoms, followed by a black half band on inner margin, then a broad brown band; median area purple filled, with an arc-shaped white discal line, running out along veins 4–5, slightly furcate at the end; a brown patch at costa; outer line excurved over cell, whitish, shaded with black in the curve and followed by a black patch; tornus brownish. Hind wing gray, whitish at base; some erect long black hairs on inner margin; outer line black, excurved, doubled on its inner half, followed by white below; margin faintly fulvous with an inner line; four minute black points with metallic coppery scales on inner half of the margin, which is excised at discal and submedian folds. Expanse, 13 mm.

*Type.*—Female, No. 16169, U.S.N.M.; Alhajuelo, April, 1911 (Busck). Also another female from the same place.

Very close to *Ambia metalophota* Hampson from Jamaica (which is not an *Ambia*), perhaps the same species, but the present form is darker in tone and rather widely separated geographically.

**SUFETULA DIMINUTALIS Walker.**

14. Tabogilla Island, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**SUFETULA HYPOCHIRALIS, new species.**

Much like *S. diminutalis*, but whereas that has a broad outer dark border to the hind wing with erect outer line, this has a narrow border, the outer line oblique and joining the costa further out toward apex. The black shade across the disk on hind wing is linear. Expanse, 10 mm.

*Type.*—Female, No. 16117, U.S.N.M.; Trinidad River, May, 1911 (Busck).

**SUFETULA HYPOCHAROPA, new species.**

Similar to the preceding, but smaller; fore wing with a narrow but distinct pale orange-brown margin, lined on both sides with black, the terminal line being double and filled with this color, whereas it is single in *diminutalis* and *hypochiralis*. A patch of orange-brown at apex. Hind wing with narrow outer border, the discal shade broad and diffused, undifferentiated from the discal spot. Expanse, 9.5 mm.

*Type.*—Male, No. 16118, U.S.N.M.; Porto Bello, May 1912 (Busck). Also 15 others with additional localities, Paraiso, Canal Zone, January, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Corozal, Canal Zone, April, 1912 (Busck), November, 1912 (C. P. Crafts); Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**SCYBALISTA SEMIFERREALIS Hampson.**

29. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek), August and November,

1912 (C. P. Crafts); Alhajuelo, April, 1911 (Busck); La Chorrera, April and May, 1912 (Busck); Paraiso, Canal Zone, May, 1911 (Busck).

**SCYBALISTA POTENTALIS, new species.**

Fore wing white with dense longitudinal shades of ocher-brown; subbasal line oblique, faint, ocher-brown; inner line white with dark brown outer edge, oblique across cell, incurved to submedian, then oblique below; discal mark dark brown, lunate; outer line white, edged by dark brown within, excurved above, dentate at vein 3, a long inward tooth at vein 2, running in along 1, then parallel to inner line to margin; a row of uniform terminal dashes, preceded by white. Hind wing whitish along costa, ocher-brown shaded outwardly; outer line curved, white, brown within, obsolete at both ends; four central rounded black terminal dots, faintly duplicated within. Expanse, 14 mm.

*Type*.—Female, No. 16115, U.S.N.M.; Taboga Island, February, 1912 (Busck).

**SYMPHYSA AMŒNALIS Walker.**

1. Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**ZINCKENIA FASCIALIS Cramer.**

4. Porto Bello, March, 1911 (Busck) Corozal, Canal Zone, July and November, 1912 (C. P. Crafts).

**ZINCKENIA PERSPECTALIS Hübner.**

14. Porto Bello, February, 1911, and April, 1912 (Busck); Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck); July, August, and November, 1912 (C. P. Crafts); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**DESMIA TAGES Cramer.**

5. Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, June and August, 1912 (C. P. Crafts).

**DESMIA BAJULALIS Guenée.**

2. Trinidad River, March, 1912 (Busck).

**DESMIA NOTALIS Felder.**

3. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**DESMIA GEMINALIS Snellen.**

2. Chiriqui, May, 1907 (W. Schaus); Cabima, May, 1911 (Busck).

The male antennæ are thickened on basal two-fifths, then bent, with minute tuft only. The specimen from Chiriqui is apparently the female.

**DESMIA TETRATOCERA, new species.**

Thickened basal part of antenna not over the basal fourth, then a tuft and curved region. Markings such as in *geminalis*, but the hind wing washed with white on costa to below vein 6; fringe blackish outwardly, not white. Expanse, 27 mm.

*Type.*—Male, No. 16124, U.S.N.M.; Tabernilla, Canal Zone, May, 1907 (Busck).

**DESMIA PARASTIGMA, new species.**

Male antennæ unmodified, with bristles and cilia. Black; abdomen with posterior segmental white lines, anal segment white-lined. Fore wing with two white-hyaline spots, the inner oblique, notched on median vein, followed by a band below, defined only by a little whitish shade beyond; outer spot from vein 4 to the subcostal, narrower above. Hind wing with costa washed with sordid whitish to below vein 6; a little white dash across cell; a long white streak form subcostal to near tornus, widened a little at veins 3–5, tapering below; fringes pale with fuscous interline. Expanse, 29 mm.

*Type.*—Male, No. 16121, U.S.N.M.; Cabima, May, 1911 (Busck). Also a male from Guapiles, Costa Rica (W. Schaus).

**DESMIA PHAIORRHŒA, new species.**

Black; fore wing with two oval white spots as in *funebralis* Guenée. Hind wing with an inner spot below cell running nearly to inner margin and duplicated without by a narrow white line; outer spot beyond cell, from subcostal to vein 3, rounded; a long double brown anal tuft in the male; antennæ unmodified. Expanse, 25 mm.

*Type.*—Male, No. 16122, U.S.N.M.; Porto Bello, May, 1912 (Busck).

**DESMIA ACLISTALIS, new species.**

Black, replaced by bronzy brown, the black remaining only around the spots and at base of fringe; spots with wavy outline, the inner from the subcostal to vein 1, followed by a white speck below; the outer from the subcostal to vein 3, narrow above. Hind wing with a very wide spot, covering half of the wing in the center, crenulate without; fringe whitish outwardly. Expanse, 16 mm.

*Type.*—Male, No. 16123, U.S.N.M.; La Chorrera, April, 1912 (Busck).

**EURRHYPARODES SPLENDENS Druce.**

10. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, July and August, 1912 (C. P. Crafts).

**EURRHYPARODES LYDANUS Druce.**

15. Taboga Island, February, 1912 (Busck); Tabogilla Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July and August, 1912 (C. P. Crafts); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**EURRHYPARODES SCULDUS, new species.**

Thorax and fore wing dark brown, lustrous, a little purplish; inner line straight, dark, unrelieved and obscure; outer line outbent at veins 3–5 with two teeth, relieved by narrow straw-colored patches before the teeth and following most of the line outwardly; fringe dark, with pale luster in oblique light. Hind wing with the base pale whitish, tinted with straw-color; a black dot in cell; outer area purplish brown; mesial line detached from the dark area above, broken, showing two dots beyond the cell as remains of teeth. Expanse, 12 mm.

*Cotypes.*—Five specimens, No. 16125, U.S.N.M.; Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**ENTREPHIA LEVINIA** Cramer.

4. Trinidad River, March and June, 1912 (Busck); Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**PAGYDA TRADUCALIS** Zeller.

6. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck).

La Chorrera, May, 1912 (Busck).

**ERCTA ORNATALIS** Duponchel.

1. Porto Bello, March, 1911 (Busck).

**ERCTA VITTATA** Fabricius.

9. Taboga Island, February, 1912 (Busck); Porto Bello, March, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek), August, 1912 (C. P. Crafts).

**LEUCOCHROMA COROPE** Cramer.

13. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); July, 1912 (J. Zetek, C. P. Crafts); August, 1912 (C. P. Crafts); Cabima, May, 1911 (Busck).

**LEUCOCHROMA COLUMBIENSIS** Hampson.

3. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck).

**LEUCOCHROMA EUPHTHINYLLA**, new species.

White; markings ocher-brown, arranged as in *bicoloralis* Dyar; color of the markings browner, less orange; a gray-brown point on margin below apex and stain on costa at inception of outer line; markings closely as in *bicoloralis*, rather fuller, the white areas more restricted, showing especially in the submarginal patch, which is large, well filled out close to margin. Expanse, 19 mm.

*Type.*—Male, No. 16126, U.S.N.M.; from a series of 20, Taboga Island, February, 1912 (Busck). Other localities are Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, June, 1912 (Busck).

In this and the following species the fore wings have the outer margin a little more oblique and the apex more pointed than usual in *Leucochroma*. The palpi have the tuft in front of the third joint square rather than triangular. They agree with *L. bicoloralis* Dyar.[1]

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[1] *Ischnurges bicoloralis* Dyar, Zoologica, vol. 1, 1910, p. 134.

Possibly these should form a new genus, but as they do not differ markedly from *Leucochroma*, and are led up to in markings by other species,[1] I leave them in this genus. They can not be placed in *Ischnurges*, in which genus I originally described *bicoloralis*.

**LEUCOCHROMA EUPHARAMACIS, new species.**

Close to *bicoloralis* Dyar, the colors the same, the markings fuller throughout, the white spaces reduced. Trace only of the brown specks below the apex and at inception of the outer line; basal markings of fore wing confluent, marginal marks continuous. Expanse, 17 mm.

*Type*.—Female, No. 16128 U.S.N.M., selected from a series of 17, Trinidad River, March, 1912 (Busck). Other localities are Corozal, Canal Zone, June, 1912 (Busck), July, 1912 (C. P. Crafts).

Very close to *bicoloralis* Dyar, possibly a race of it.

**MARASMIA COCHRUSALIS Walker.**

40. Porto Bello, February, 1911 (Busck); Corozal, Canal Zone, March, 1911, and May, 1912 (Busck), July, 1912 (J. Zetek, C. P. Crafts); La Chorrera, April, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**SYNGAMIA ABNORMALIS Snellen.**

9. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

The specimens agree with a female from Costa Rica labeled by Mr. Schaus. In the male, there is a slight swelling on the costa between end of first line and discal dot.

**SYNGAMIA SCIAGRAPHALIS, new species.**

Differs from *abnormalis* (Snellen) Schaus in being tinged with ocher, especially along inner margin, the costa of the male straight, without swelling; lines of hind wing not quite as coarse and rigid as in *abnormalis*, the whitish bordering shades less contrasting. Expanse, 15 mm.

*Type*.—Male, No. 16119, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also eight others, La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts), November, 1912 (C. P. Crafts).

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[1] *Leucochroma meliusalis* Walker has the pattern of coloration of these forms, which is still more nearly approximated in—

**LEUCOCHROMA ANALYTICA, new species.**

Similar to *L. meliusalis*, with which it was confused in the collection, but with the blackish scales almost wholly removed. In *meliusalis* there are indistinct dark edgings to the stigmata and a dark terminal line, which breaks into three distant dots below apex, derived from the *corope* type. In *analytica*, all the marks are orange-yellow on a white ground, broadened, diffused, the terminal line also orange, except the three minute dark dots below apex. Terminal line on hind wing a little darker than the other markings, but not dark as in *meliusalis*. Expanse, 19 mm.

*Cotypes*.—Four specimens, No. 16127, U.S.N.M.; Trinidad, British West Indies (Schaus collection).

**SYNGAMIA MELANOBATHRUM, new species.**

A smaller species with straight costa in the male, resembling *S. cognatalis* (identified by Schaus); more uniformly straw-yellow, without the general dark shading of *cognatalis*, the lines of hind wing not so flexuous and irregular, though much less rigid than in *abnormalis* or *sciagraphalis*, but easily distinguished from all by a patch of long black scales at base of costa of hind wing of male on both surfaces of the wing. Expanse, 13 mm..

*Type.*—Male, No. 16120, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also 14 males and 9 females, Cabima, May, 1911 (Busck); Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck), July, 1912 (J. Zetek, C. P. Crafts), November, 1912 (C. P. Crafts).

**SYNGAMIA RUBRICINCTALIS Guenée.**

3. Taboga Island, February, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**SYNGAMIA PEPITALIS Guenée.**

1. Tabernilla, Canal Zone, May, 1907 (Busck).

**SYNGAMIA FLORELLA Cramer.**

22. Porto Bello, February, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts); Gatun, Canal Zone, August, 1909 (A. H. Jennings).

**SYNGAMIA AQUATICALIS Guenée.**

4. Cabima, May, 1911 (Busck); Corozal, Canal Zone, July and November, 1912 (C. P. Crafts).

**SYNGAMIA HÆMORRHOIDALIS Guenée.**

2. Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**SYNGAMIA INFLAMMATALIS Hampson.**

1. Trinidad River, March, 1912 (Busck).

**SYNGAMIA FLABELLALIS Guenée.**

5. Corozal Canal Zone, August and November, 1912 (C. P. Crafts).

**SYNGAMIA TYTIUSALIS Walker.**

1. Trinidad River, March 1912 (Busck).

**SAMEA ECCLESIALIS Guenée.**

71. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**SAMEA MICTALIS Hampson.**

2. Paraiso, Canal Zone, February, 1911 (Busck).

**SAMEA CHLORISTALIS Hampson.**

28. Porto Bello, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek, C. P. Crafts).

**SAMEA MULTIPLICALIS** Guenée.

71. Trinidad River, March 1912 (Busck); La Chorrera, April and May, 1911 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**TRITHYRIS SCYLLALIS** Walker.

3. Trinidad River, March, 1912 (Busck).

**TRITHYRIS SUNIALIS** Snellen.

4. Porto Bello, February and March, 1911 (Busck); Trinidad River, March, 1912 (Busck).

**TRITHYRIS PRETIOSALIS** Schaus.

1. Cabima, May, 1911 (Busck).

**TRITHYRIS APICOLOR** Druce.

2. La Chorrera, May, 1912 (Busck).

**HILEITHIA DECOSTALIS** Guenée.

1. Trinidad River, May, 1911 (Busck).

**MARASMIA FLORIDALIS** Fernald.

1. Taboga Island, February, 1912 (Busck).

**BOCCHORIS APYGALIS** Guenée.

11. Taboga Island, February, 1912 (Busck); Trinidad River, March and June, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek, C. P. Crafts), November, 1912 (C. P. Crafts).

There appear to be six species among this material, but there are too few of a kind for satisfactory treatment. In the collection are three specimens labeled *apygalis*, two from Mexico (not alike), both females, and one from Costa Rica, a male, with prominence on basal joint of antenna, but it does not agree with either of the Mexican specimens. Two other species are before me from Costa Rica, but unnamed, one with prominence on basal joint of male antenna, the other without this structure. I name herewith all of the Panama forms, as I do not think that any of them are Guenée's *apygalis*, described from Colombia from a single female with the costal dots opened into rings. My *nacobora* is the only one showing this marking, and it does not appear to agree otherwise with *apygalis*.

No. 1. **HOHAËLIS**, new species.

Small, nearly white, the male without modification at base of antenna; costal dots of fore wing confused, at base reaching to subcostal vein; lines slender; ground color not much shaded with dark; space between outer and subterminal lines moderately wide, narrowly reaching costa but cut off from inner margin; discal dots of both wings with the centers nearly occluded. Expanse, 11 mm.

*Cotypes.*—Two males, No. 16129, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck); Taboga Island, February, 1912 (Busck).

**No. 2. SPARSALIS, new species.**

Medium sized, faintly straw-yellow tinged; costal dots of fore wing small and sparse, on costa only, separated by twice their own diameters or more; lines moderate; ground color shaded with dark along the margins of both wings; space between outer and subterminal lines moderately wide, narrowly reaching costa and indistinctly so the inner margin; discal dot of fore wing of two lines joined by a bar, of hind wing solid. Expanse, 12 mm.

*Type.*—Female, No. 16130, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**No. 3. APPROPRIALIS, new species.**

Medium sized, pale straw yellow; costal dots of fore wing numerous and rather dense, those near base reaching subcostal vein; lines moderate, distinct; ground color strongly shaded with brown along the margins of both wings, not elsewhere; space between outer and subterminal lines moderately wide, narrowly reaching the costa and indistinctly so the inner margin; discal dot of fore wing closed above and crossed by a central bar, of hind wing small, solid, forming part of the mesial line. Expanse, 13–14 mm.

*Cotypes.*—Two females, No. 16131, U.S.N.M.; Trinidad River, March, 1912 (Busck).

I associate with these the unidentified male from Costa Rica (Banana River, March, 1907, W. Schaus) without modification at the base of the antennæ.

**No. 4. DIFFERENTIALIS, new species.**

Medium sized; pale straw yellow; costal dots small, but rather numerous and dense; lines very fine and open, the marginal shade slight, giving a general pale, unshaded appearance; space between outer and subterminal lines wide, reaching costa and margin; orbicular annular, semidetached from the inner line; discal dot closed above and with central bar, of hind wing not quite occluded and detached from the inner line. Expanse, 13–14 mm.

*Cotypes.*—Four females, No. 16132, U.S.N.M.; Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts), November, 1912 (C. P. Crafts).

**No. 5. DENSALIS, new species.**

Small, pale straw yellow, shaded with ocher-brown beyond the discal mark; costal dots dense, regular, reaching subcosta, where there is a longitudinal shade; ground color slightly irrorated and with patches of dark brown shading at origins of discal venules of both wings, the marginal shading broken up into patches; space between outer and subterminal lines moderately wide, reaching costa; discal dot of fore wing lunate, annular, of hind wing solid. Expanse, 11 mm.

*Type.*—Female, No. 16133, U.S.N.M.; Taboga Island, February, 1912 (Busck).

**No. 6. NACOBORA, new species.**

Rather larger than the others and with broader, squarer wings; white, tinged with sordid creamy; costal dots small, sparse, the basal three distinctly annular; lines slender, blackish, the inner running within the orbicular instead of joining it above; reniform widely annular; marginal shade represented by a few dots only, the subterminal line faint and running close to the outer line above. Hind wing with discal dot narrowly annular; a dusky shade between the inner and outer lines; termen as on fore wing. Expanse, 14 mm.

*Type.*—Female, No. 16134, U.S.N.M.; Trinidad River, June, 1912 (Busck).

**BOCCHORIS EDAPHODREPTA, new species.**

Rather small, the wings narrow and acute at apex; antennæ of male without basal modification; white with irrorations and shades of pale creamy brown; thorax and base of fore wing heavily and densely dotted with black; lines slender, dark, the inner straight, upright, outer oblique, running in along vein 2 to a sinus, then to inner margin; discal mark solid; a faint subterminal brownish shade; two black dots on the costa subapically. Hind wing with solid discal dot, with black shade thence to inner margin; two outer lines joining near costa, roundedly and widely separated mesially, then close and parallel on inner third; a brown subterminal shade, especially toward apex. Expanse, 11.5 mm.

*Type.*—Male, No. 16135, U.S.N.M.; Porto Bello, May, 1911 (Busck).

**BOCCHORIS INVIDIOSA, new species.**

A larger species than the preceding, the wings rather narrow and square at tip; whitish, lightly tinted with straw color, the brown marginal shade dark and continuous on fore wing, paler and scattered on hind wing; lines slender, the outer finely denticulate, both on its outcurve below costa and before the retreat along vein 2; similar on hind wing, straight only from vein 2 to tornus; costal dots small, annular, well spaced, less than twice their own diameters apart; reniform open above and below, without cross-bar; on hind wing widely annular with a slightly curved line running to above tornus. Expanse, 18 mm.

*Type.*—Female, No. 16136, U.S.N.M.; Trinidad River, May, 1911 (Busck).

Nearest to Guenée's characterization of *apygalis* of any before me. The specimens in the collection allied to this (one species of two females from French Guiana, one species of three males and four females from Aroa, Venezuela) were all placed under *Hileithia decostalis* Guenée, on general appearance, evidently, as they differ in venation, while none bear identification labels. There are evidently a considerable number of allied species in this group, and *apygalis* can only be positively identified from Colombian material.

**BOCCHORIS RHEHABALIS, new species.**

Closely allied to *B. rhealis* Druce; smaller, whiter, the subterminal line on both wings straighter, not forming two arcs as in that species; the inner line of fore wing is very slender and faint whereas it is as distinct as the others in *rhealis*. Expanse, 13 mm.

*Type.*—Female, No. 16137, U.S.N.M.; Cabima, May, 1911 (Busck).

I have placed *rhealis* and *magnalis* Guenée in *Bocchoris* instead of *Nacoleia* as done by Hampson, because I think the front of the head might as properly be described "flat and oblique" as "rounded," it being of an ambiguous shape, and by so doing I associate these species with the others which they resemble in markings.

**PILOCROCIS INFUSCALIS Guenée.**

1. Tabernilla, Canal Zone, May, 1907 (Busck).

**PILOCROCIS INGUINALIS Guenée.**

1. La Chorrera, May, 1912 (Busck).

**PILOCROCIS ANORMALIS Guenée.**

5. Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek), August, 1912 (C. P. Crafts).

**PILOCROCIS COLLUSTRALIS Möschler.**

1. Cabima, May, 1911 (Busck).

**PILOCROCIS RAMENTALIS Lederer.**

4. Taboga Island, June, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek), November, 1912 (C. P. Crafts).

**PILOCROCIS CYCLOSTIGMA, new species.**

Palpi with the scaling moderate and separate on the joints, the third joint rather long, tufted in front, the tuft even, not triangular; scaling of first joint white, the others brown. Wings blackish brown; lines dark, the inner curved, rather oblique; reniform annular, orbicular a dot; outer line excurved over discal nervules, retracted by vein 2 to below reniform. Hind wing with mesial line resembling outer of fore wing but less retracted; discal mark only a trace. Expanse, 24 mm.

*Type.*—Female, No. 16144, U.S.N.M.; Trinidad River, June, 1912 (Busck).

**PILOCROCIS RUNATALIS, new species.**

Palpi broadly scaled, the scales of second joint projecting triangularly at tip; third joint minute with a little triangular tuft. Blackish brown, a little bronzy; lines dark, the inner obscure; outer line rather broad, incurved along vein 2; reniform solid, black, distinct. Hind wing with mesial line nearly regularly curved, but slightly, if at all disturbed at vein 2. Lower half of abdomen and legs white, the front tibiæ dark at tips. Expanse, 20 mm.

*Cotypes.*—Two females, No. 16145, U.S.N.M.; Corozal, Canal Zone, May, 1912 (Busck), August, 1912 (C. P. Crafts).

**PILOCROCIS MODESTALIS** Schaus.

2. La Chorrera, May, 1912 (Busck).

**PILOCROCIS CRYPTALIS** Druce.

1. Trinidad River, March, 1912 (Busck).

**PILOCROCIS TERMINALIS** Dognin.

1. Alhajuelo, April, 1911 (Busck).

**PILOCROCIS DECORA**, new species.

Palpi shortly and closely scaled, the third joint distinct, its frontal tuft very short; first joint white below and a little white only on second. Fore wing of male without modification of costa. Lines as in *P. cora* Dyar, without any white edges; orbicular present, nearly as distinct as reniform. Wings broad, as in *cora*. Expanse, 30 mm.

*Type.*—Male, No. 16143, U.S.N.M.; Cabima, May, 1911 (Busck). Also a male from Guapiles, Costa Rica, November, 1907 (W. Schaus), and a female from Peru, the former labeled *infuscalis* Guenée, but differing in the palpi as well as the larger size.

**PILOCROCIS CHLORISALIS** Walker.

3. Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck), and November, 1912 (C. P. Crafts).

**SPILOMELA FIMBRIAURALIS** Guenée.

7. La Chorrera, May, 1912 (Busck); Trinidad River, March and June, 1912 (Busck); Corozal, Canal Zone, August, 1912 (C. P. Crafts).

**SPILOMELA PŒONIALIS** Druce.

1. Cabima, May, 1911 (Busck).

**SPILOMELA PERSPICATA** Fabricius.

13. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck); Corozal, Canal Zone, March, 1911, and May, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, April and May, 1912 (Busck); Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**SPILOMELA DISCORDENS**, new species.

White, marked with brown as in *S. perspicata* Fabricius with the following differences: Two inner lines instead of three, the outer one obsoletely furcate on costa; outer line forming a regular zigzag, not divided by vein 2, its upper limb outwardly oblique; terminal brown space with a pale ray from tornus to near middle. Hind wing with submarginal line not fused to the middle one, but broken off. Expanse, 21 mm.

*Cotypes.*—Two males, two females, No. 16146, U.S.N.M.; Corozal, Canal Zone, July, 1912 (J. Zetek), November, 1912 (C. P. Crafts); Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck). Also a male and two females from the Guianas (W. Schaus).

**MESOCONDYLA CONCORDALIS** Hübner.

25. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February and March, 1911 (Busck); Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, May, 1912 (Busck).

**MESOCONDYLA TARSIBARBALIS Hampson.**

1. La Chorrera, May, 1912 (Busck).

**CONCHYLODES SALAMISALIS Druce.**

3. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**CONCHYLODES PLATINALIS Guenée.**

6. Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**CONCHYLODES OVULALIS Guenée.**

20. Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek, C. P. Crafts), November, 1912 (C. P. Crafts); Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**PHRYGANODES VARIALIS Walker.**

5. Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, June, 1912 (Busck).

**PHRYGANODES ALBIRENALIS Hampson.**

2. Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, April, 1912 (Busck).

**PHRYGANODES MILVALIS Druce.**

1. Trinidad River, June, 1912 (Busck).

**PHRYGANODES INSOLUTALIS Möschler.**

2. Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, June, 1912 (Busck).

**PHRYGANODES HUMERALIS Guenée.**

3. Trinidad River, March, 1912 (Busck).

**PHRYGANODES PROLONGALIS Guenée.**

9. Paraiso, Canal Zone, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**PHRYGANODES ORIGINALIS Lederer.**

2. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1911 (Busck).

**PHRYGANODES SIMIALIS Guenée.**

2. Corozal, Canal Zone, June, 1912 (C. P. Crafts), July, 1912 (J. Zetek).

**PHRYGANODES MARTYRALIS Lederer.**

1. Trinidad River, March, 1912 (Busck).

**PHRYGANODES CLEMENTALIS Schaus.**

1. Cabima, May, 1911 (Busck).

**DICHOGAMA SMITHII Möschler.**

1. Taboga Island, February, 1912 (Busck).

**DICHOGAMA BERGII Möschler.**

2. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck).

**NACOLEIA ACUTANGULALIS Snellen.**

3. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**NACOLEIA CRAFTSIALIS, new species.**

Pattern and color of *N. acutangulalis*, but differs in detail: Inner line straighter, nearer the base; orbicular round, detached from costa; reniform attached to outer line below, closed at both ends; outer line upright above, flexuous, not arcuate; submarginal incurved at subcostal and submedian; no subapical dot. Hind wing with the lower segments of the lines arcuate, not looped, no yellow filling; outer line incised subcostally. Expanse, 12–14 mm.

*Cotypes.*—Three specimens, No. 16138, U.S.N.M.; Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

Near *Nacoleia* (*Bocchoris*) *minima* von Hedemann from Jamaica.

**NACOLEIA MARGINALIS, new species.**

Pattern of *craftsialis*, but the lines and margin suffused with ocher gray, leaving the ground color as white patches; subterminal line of both wings further from the margin than in *craftsialis*, forming a broad ocher-gray border, reaching almost to termen. Expanse, 14 mm.

*Type.*—Male, No. 16139, U.S.N.M.; Corozal, Canal Zone, July, 1912 (J. Zetek).

**NACOLEIA CANACEALIS Walker.**

3. Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck); Trinidad River, June, 1912 (Busck).

**NACOLEIA LUNULALIS Hübner.**

2. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**NACOLEIA DORISALIS Walker.**

2. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**NACOLEIA BRUNNESCENS, new species.**

More distinctly brown than *lunulalis* or *dorisalis* Walker. Lines the same, but the outer line white only at costa; no white line before the marginal line. Expanse, 28 mm.

*Type.*—Female, No. 16140, U.S.N.M.; Trinidad River, June, 1912 (Busck).

Judging by males from Costa Rica, which, though labeled *dorisalis* Walker, are apparently this species, the male has the anal angle of hind wing abbreviated and hairy, the hind tibiæ curved, with a projecting point of scales at tip; ventral valve at base of abdomen with tuft of hairs at tip.

**NACOLEIA NANNALIS, new species.**

Blackish; fore wing more brownish centrally; lines slender, white, the inner curved; outer line broader on costa, a little outcurved beyond cell, oblique below; discal mark narrow, oblique, white; a dotted white line before the double black marginal line. Hind wing with the inner line curved, white, at about the inner third, followed distantly by a bluish duplicating shade; subterminal white line more continuous than on fore wing; fringes whitish. Expanse, 14 mm.

*Type.*—Female, No. 16141, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also another, apparently the same, but worn, Corozal, Canal Zone, March, 1911 (Busck).

No male is at hand. The species may be recognized by its very small size and the unusually basal position of the line on hind wing.

**NACOLEIA INDICATA Fabricius.**

14. Taboga Island, June, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek), August and November, 1912 (C. P. Crafts).

**NACOLEIA XANTHODYSANA, new species.**

Fore wing reddish brown, the lines as in *indicata* Fabricius, but faint, the outer denticulate. Hind wing fuscous shaded, the lines faint. Outer margin of fore wing straight from apex to vein 3, then roundedly prominent; fringe yellow, blackish at the prominence; a faint double terminal line. Hind wing with the fringe yellow, interlined with brown, interrupted at submedian fold. Expanse, 19 mm.

*Type.*—Female, No. 16142, U.S.N.M.; Trinidad River, June, 1912 (Busck).

Mr. Schaus sent two females from Costa Rica labeled "*N. indicata* Fab. ♀", but I have numerous females of that species agreeing entirely with the males.

**NACOLEIA PERSINUALIS Walker.**

1. Corozal, Canal Zone, August, 1912 (C. P. Crafts).

**NACOLEIA STYGIALIS Hampson.**

4. Taboga Island, February, 1912 (Busck) La Chorrera, May, 1912 (Busck).

**NACOLEIA PELEALIS Walker.**

4. Taboga Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**NACOLEIA XANTHIALIS Guenée.**

3. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, August, 1912 (C. P. Crafts).

**NACOLEIA VERITALIS, new species.**

White, with slight bronzy brown tint; lines slender, blackish, the inner gently curved; outer line wavy from costa tornus, then recurved to below reniform and again to inner margin; orbicular and reniform annular. Hind wing with median segment of outer line projected, touching the margin beyond tornus; a terminal row of close dots on both wings. Expanse, 15 mm.

*Cotypes.*—Two specimens, selected from a series of 11, No. 16149, U.S.N.M.; Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

Allied to *N. lacertalis* Guenée, *L. colubralis* Guenée and *L. batrachialis* Guenée, in markings, but those three species are properly referable to the genus *Stenia* in the Nymphulinæ, whereas the present species as a true *Nacoleia.*

**NACOLEIA STENIALIS Guenée.**

40. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello. April, 1912 (Busck); Trinidad River, May, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck); Corozal, Canal Zone, July and August, 1912 (C. P. Crafts).

**NACOLEIA SCHISTESEMALIS Hampson.**

7. Porto Bello, March, 1911, and May, 1912 (Busck); Corozal, Canal Zone, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**DICHOCROCIS SABATALIS Druce.**

3. Cabima, May, 1911 (Busck).

**SYLEPTA GORDIALIS Guenée.**

4. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, March, 1912 (Busck).

**SYLEPTA DIOPTALIS Walker.**

1. Trinidad River, March, 1912 (Busck).

**SYLEPTA STRIGICINCTA Hampson.**

6. Cabima, May, 1911 (Busck).

One specimen is a male and has the brown border broader than in the females.

**SYLEPTA AMANDO Cramer.**

2. Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck).

**SYLEPTA ELEVATA Fabricius.**

7. Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, March and June, 1912 (Busck).

**SYLEPTA SILICALIS Guenée.**

5. Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, August and November, 1912 (C. P. Crafts).

This species occurs also in the United States, and had been recorded under the (erroneous) name *S. fluctuosalis* Lederer.[1] The larvæ have been found on nettle in Florida.

**SYLEPTA IMBROGLIALIS, new specie**

Straw-yellow, suffused with brown; costa brown-shaded, as also margins of both wings; lines single, moderate, the inner curved, the outer denticulate, concave or nearly straight above, exserted over veins 2–5, running in along vein 2 faintly, forming a sinus, and below it a tooth on submedian; orbicular punctiform, reniform lunate. Hind wing with a spot at end of cell; mesial line similar to the outer of fore wing. Expanse, 24–26 mm.

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[1] Bull. 52, U.S.N.M., No. 4308.1, 1903.

*Cotypes.*—Three females, No. 16150, U.S.N.M.; Corozal, Canal Zone, April, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck). Also 13 specimens from French and Dutch Guianas and three from Aroa, Venezuela (Schaus collection). One of the latter is labeled "?*Pachyzancla ægrotalis* Zell. ♀" by Sir G. F. Hampson, but the palpi do not seem to me to agree with those of *Pachyzancla*. The specimen examined by Sir George has the palpi broken, but anyway the specimen is very much too large for the female of *ægrotalis*, of which I have many of the same size as males. The present species is near *S. silicalis* Guenée, but the markings darker and more clearly written, the costa also dark.

**SYLEPTA LATICALIS** Lederer.

1. La Chorrera, May, 1912 (Busck).

**SYLEPTA CALANTICALIS** Druce.

2. Taoga Island, February, 1912 (Busck); Alhajuelo, April 1911 (Busck).

**SYLEPTA EXCELSALIS** Schaus.

1. Trinidad River, March, 1912 (Busck).

**PILETOSOMA NOVALIS** Walker.

2. Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

Two entirely different insects have been under this name in the collection, one from Ecuador, identified by Schaus, the other from French Guiana, identified by Hampson. The Panama specimens agree with the one from French Guiana, and I have accordingly accepted Hampson's identification of the species.

**PILETOSOMA THIALIS**, new species.

A little larger and broader-winged than *novalis*, the male antennæ with a thickening bearing short hairs near the middle, the anal tuft very small and brush-like, inconspicuous; outer margin of fore wing quite straight, with a small notch at end of submedian fold. Color as in *novalis* and equally without markings, the darker patch at anal angle of hind wing somewhat larger and a little less contrasted. Expanse, 32 mm.

*Type.*—Male, No. 16147, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck).

**PILETOSOMA ARGOPONALIS**, new species.

Wings broad, the outer margin rounded below, without notch; male antennæ minutely ciliate, unmodified; anal tuft large and rather long, but nothing like the enormous development of this structure in *novalis*. Brown-black with slight bronzy reflection;

lines showing only in traces; reniform small, annular; inner and outer lines faintly pale, the outer looped under reniform, thence oblique and irregular to inner margin. Expanse, 27 mm.

*Cotypes.*—Male and female, No. 16148, U.S.N.M.; Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

The lateral tufts at the base of the abdomen are very slight in this species, but I think enough to admit it to the genus.

**LYGROPIA FUSCICOSTALIS Hampson.**

5. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**LYGROPIA LELEX Cramer.**

9. Paraiso, Canal Zone, January and February, 1911 (Busck); Trinidad River, March and June, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Porto Bello, April, 1911 (Busck).

**LYGROPIA UNICOLORALIS Guenée.**

2. Trinidad River, March, 1912 (Busck); Porto Bello, June, 1912 (Busck).

**LYGROPIA OBRINUSALIS Walker.**

1. Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**LYGROPIA ALITEMERALIS, new species.**

Fore wing pointed at apex; yellow; a double marginal line, the inner segment dotted on fore wing; fringe brownish; a dot on costa and inner margin near base; inner line straight, forming a dot on costa; reniform annular; outer line wavy above, bent in along interspace 2–3, slightly wavy again to inner margin. Hind wing with a similar line. Palpi with black rings at the ends of the first and second joints, the latter broadly broken on the outer side. Fore tarsi white, a black band at apex of tibia and first tarsal, tip of third and all of fourth black. Expanse, 21 mm.

*Type.*—No. 16155, U.S.N.M., selected from a series of 6, Cabima, May, 1911 (Busck). Also one male, Geldersland, Surinam River, Dutch Guiana, labeled *cernalis* Guenée.

Allied to *cernalis* Guenée and *bipunctalis* Hampson; differing from both in the coloration of palpi, from the former also in wing shape and from the latter also in size and annular reniform.

**LYGROPIA CHROMALIS Guenée.**

2. Trinidad River, March, 1912 (Busck).

**LYGROPIA LEIALIS Dognin.**

3. Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**LYGROPIA COSMIA, new species.**

Bronzy brown-black; fore wing with a costal yellow half-bar on outer fourth; a double spot in cell, conjoined below and touching an oblique broad half-band near base of inner margin. Hind wing yellow at base, the edge of the color cleft by a small discal mark fused to the outer dark area. Expanse, 15 mm.

*Cotypes.*—Two specimens, selected from a series of 17, No. 16151, U.S.N.M.; Porto Bello, March, 1912 (Busck).

Allied to *L. imparalis* Walker from Jamaica.[1]

**LYGROPIA ERYTHROBATHRUM, new species.**

Bronzy brown-black, a little grayish; fore wing with white costal two-thirds bar on outer third and white one at inner third, not attaining costal edge; base stained with dark red on lower portion. Hind wing whitish at base, stained with dark red, the whitish area not quite including a discal mark of the ground color. Expanse, 15 mm.

*Type.*—No. 16152, U.S.N.M.; selected from a series of 28; Corozal, Canal Zone, April, 1911 (Busck). Other from Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); La Chorrera, April, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, June, 1912 (C. P. Crafts). One of the specimens taken by Mr. Crafts has the markings of both wings yellow at base instead of red.

**LYGROPIA MURINALIS Schaus.**

4. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, Julv (J. Zetek) and August, 1912 (C. P. Crafts).

**AGATHODES DESIGNALIS Guenée.**

2. Porto Bello, March, 1911 (Busck).

**GLYPHODES NITIDALIS Cramer.**

1. Porto Bello, February, 1911 (Busck).

**GLYPHODES LATILIMBALIS Guenée.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

As determined by Mr. Schaus from Costa Rican specimens (*latilimbalis* Guenée = *contactalis* Dognin), but not the *latilimbalis* of his Guiana collections, nor the *contactalis* labeled by Mr. Dognin. In the present form, the spot on fore wing is very much larger (*latilimbalis* is "assez petite") and has no oblique prolongation below (as in *contactalis*). The band on the hind wing also is much wider. This is evidently a race, if not a good species. The name **epimetralis** is accordingly proposed.

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[1] Two species before me from the Guianas are closely allied, and may be characterized here.

**LYGROPIA GLAPHYRA, new species.**

Bronzy brown-black; fore wing with a small yellow costal spot at outer third; a narrow band at basal third, not attaining costa, bent below cell at right angles toward base and joining some diffused yellow on inner margin. Hind wing narrowly yellow at base. Expanse, 12 mm.

*Type.*—No. 16153, U.S.N.M.; St. Laurent, Maroni River, French Guiana, September, 1904 (W. Schaus).

**LYGROPIA DISARCHE, new species.**

Fore wing bronzy brown; two erect yellowish white bars, one costal at outer third, the other at inner third, not attaining costa or inner margin. Hind wing whitish costally at base. Expanse, 13 mm.

*Cotypes.*—Two specimens, selected from seven, No. 16154, U.S.N.M.; Cayenne, French Guiana, June, 1904 (W. Schaus).

*Type.*—No. 16156, U.S.N.M. Besides the type, six are before me from Costa Rica (W. Schaus) and one from Coatepec, Mexico (R. Müller).

**GLYPHODES ARGUTA Lederer.**

9. Taboga Island, February, 1912 (Busck); Trinidad River, March and June, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek, C. P. Crafts).

**GLYPHODES PLUMBIDORSALIS Guenée.**

1. Paraiso; Canal Zone, February, 1911 (Busck).

**GLYPHODES LUCIDALIS Hübner.**

3. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**GLYPHODES HYALINATA Linnæus.**

3. Porto Bello, March, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**GLYPHODES INFIMALIS Guenée.**

23. Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

Of the above, five are of a variation with the marginal band broader, that of fore wing more concave. The variation is gradual in the five specimens, and the size is the same. It approaches *modialis* Dyar, but the broadening of the bands is not so great, while the size is not increased.

**GLYPHODES BUSCKI, new species.**

Translucent yellow; fore wing with a broad costal band of bronzy brown, irregular on lower edge, with a dot at bases of veins 3–5; outer border broad, with sinus centrally. Hind wing with broad curved outer border narrowing to tornus. Thorax black-brown; abdomen pale ocher brown, anal scales black. Expanse, 25 mm.

*Cotypes.*—Two males, No. 16157, U.S.N.M.; Porto Bello, February, 1911 (Busck).

Near *nitidalis* Cramer, but the yellow of fore wing runs to the base.

**GLYPHODES AMŒOSTALIS Guenée.**

1. Taboga Island, February, 1912 (Busck).

**GLYPHODES JAIRUSALIS Walker.**

1. Porto Bello, April, 1911 (Busck).

**GLYPHODES AUSONIA Cramer.**

4. Porto Bello, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**GLYPHODES SIBILLALIS Walker.**

2. Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**GLYPHODES CUMALIS Druce.**

1. Trinidad River, March, 1912 (Busck).

**CROCIDOPHORA ADORNATALIS Warren.**

1. Porto Bello, April, 1912 (Busck).

**CROCIDOPHORA ZINGHALIS Walker.**

3. Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**CROCIDOLOMIA PALINDIALIS Guenée.**

1. Porto Bello, March, 1911 (Busck).

**LEUCINODES IMPERIALIS Guenée.**

26. Porto Bello, February and March, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, March and June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**LEUCINODES ELEGANTALIS Guenée.**

22. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck); Porto Bello, April and May, 1912 (Busck); Trinidad River, March and June, 1912 (Busck).

Varies greatly in size. Some of those before me expand but 11 mm. (normal size about 25 mm.) and the markings are more or less reduced or obliterated; but they can always be told from *imperialis* Guenée by the long third joint of the palpi.

**Variety PROPHETICA, new variety.**

In this form the black line beyond the dark basal area is straight and a little outwardly oblique instead of curved; the marginal mark is reduced to a gray shade with the black submarginal patch before it. Expanse, 17 mm.

*Type.*—No. 16158, U.S.N.M.; Trinidad River, June, 1912 (Busck).

An exactly similar specimen from Avangarez, Costa Rica, July, 1907 (W. Schaus) is labeled *imperialis*, but the third joint of the palpi is too long for that species.[1]

**MEGASTES GRANDALIS Guenée.**

4. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

**ANALYTA PUCILLA Druce.**

5. Paraiso, Canal Zone, February, 1911 (Busck); Cabima, May, 1911 (Busck); Porto Bello, May, 1912 (Busck).

**ANALYTA SEMANTRIS, new species.**

Fore wing with an irregularly triangular yellow patch near middle of inner margin, the costa broadly blackish purple, the outer area suffused with red-brown; the costal edge is red-brown with three incisions, followed by a broad purple band formed of a basal stripe, the very large and full orbicular and reniform (which touch) and another stripe to apex; outer line black, slender, bordering the reniform and continued narrowly to inner margin along the edge of the yellow patch; no terminal marks. Hind wing white, yellow shaded at base, apex and over discal mark; outer line irregular, lightly excurved centrally, broken into cusps, the most distinct one on submedian fold. Expanse, 17 mm.

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[1] This type of markings is carried further in—

**LEUCINODES DISSOLVENS, new species.**

Inner line straight, very oblique, running to near middle of inner margin: marginal marking in the incision of outer margin brownish, not darker than the discal shading, preceded by a small black dash at veins 5–6. Expanse, 24 mm.

*Type.*—Female, No. 16159, U.S.N.M.; St. Jean, Maroni River, French Guiana, March, 1904 (W. Schaus); also four others, the smallest 14 mm. from French Guiana and one from Aroa, Venezuela (Schaus collection).

*Cotypes.*—Two females, No. 16160, U.S.N.M.; Trinidad River, March, 1912 (Busck). A male from St. Jean, Maroni River, French Guiana, April, 1904 (W. Schaus) is also before me.

**OMMATOSPILA NARCÆUSALIS Walker.**

2. Corozal, Canal Zone, July and November, 1912 (C. P. Crafts).

**SAMEODES DILECTICOLOR Dyar.**

2. Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck).

The male has the costa yellow (=*Sameodes flavibaccata* Hampson [1]); in the female it is black and the markings are broader (=*Pyrausta dilecticolor* [2] Dyar). Under the name *flavibaccata*, Mr. Schaus sent three distinct species from his Costa Rican collections. The bright yellow one I take to be the real *flavibaccata* and the name falls before the earlier *dilecticolor*. The reference to *Sameodes* instead of *Pyrausta* seems preferable. The two other species agree with specimens in the collection labeled *Bocchoris insipidalis* Lederer and *B. actealis* Walker, respectively. I therefore transfer these two names from *Bocchoris* to *Sameodes*, as the palpi of the species seem structurally identical with those of *flavibaccata*.

**SAMEODES ACTEALIS Walker.**

5. Porto Bello, February, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek), August and November, 1912 (C. P. Crafts).

All females, small and blunt winged in comparison with males.

**SAMEODES ZOPHYRALIS Lederer.**

13. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Porto Bello, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, August, 1912 (C. P. Crafts).

**MARUCA TESTULALIS Geyer.**

108. Porto Bello, February and March, 1911 (Busck); Taboga Island, February, 1912 (Busck); Trinidad River, March and June, 1912 (Busck).

**AZOCHIS GRIPUSALIS Walker.**

7. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**POLYGRAMMODES BÆUSCALIS Dyar.**

4. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

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[1] Ann. Mag. Nat. Hist., (8), vol. 11, 1913, p. 329.

[2] Proc. U. S. Nat. Mus., vol. 42, 1912, p. 103.

**POLYGRAMMODES OSTREALIS Guenée.**

14. Porto Bello, April, 1912 (Busck); La Chorrera, April, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Cabima, May, 1911 (Busck).

**POLYGRAMMODES HERCULES Felder.**

5. Porto Bello, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**POLYGRAMMODES HIRTALIS Guenée.**

3. Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**PACHYZANCLA PHÆOPTERALIS Guenée.**

45. Porto Bello, March, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek), August and November, 1912 (C. P. Crafts); Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck).

**PACHYZANCLA ÆGROTALIS Zeller.**

6. Paraiso, Canal Zone, February, 1911 (Busck); Porto Bello, February, 1911 (Busck); Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**PACHYZANCLA BIPUNCTALIS Fabricius.**

14. Porto Bello, February, 1912, and March, 1911 (Busck); Corozal, Canal Zone, June (C. P. Crafts), July (J. Zetek, C. P. Crafts), August and November, 1912 (C. P. Crafts).

**PACHYZANCLA DISTINICTA Kaye.**

3. Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, June and August, 1912 (C. P. Crafts).

**PACHYZANCLA XANTHOMETA Hampson.**

6. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**DIASEMIA RAMBURIALIS Duponchel.**

3. Corozal, Canal Zone, July, 1912 (J. Zetek), November, 1912 (C. P. Crafts).

**LIOPASIA SIMPLICISSIMALIS, new species.**

Fore wing carneous brown, irrorated with blackish; lines slender, blackish, the inner obliquely outcurved, the outer crenulate on its exserted medial portion; outer discal mark a powdery ringlet, inner similar, fainter, or absent. Hind wing whitish, tinged with carneous brown on margin, in the male with blackish hairs on inner margin to tornus. Expanse, 36 mm.

*Cotypes.*—Two specimens, selected from a series of nine, No. 16161, U.S.N.M.; Paraiso, Canal Zone, January and February, 1911 (Busck); also Porto Bello, May, 1911 (Busck); Carom, Trinidad, January, 1911, "Bucere worm moth" (F. W. Urich); Cayenne, French Guiana, February, 1904 (W. Schaus).

**PHLYCTÆNODES BIFILALIS Hampson.**

1. Corozal, Canal Zone, July, 1912 (J. Zetek).

**PHLYCTÆNODES HELVIALIS** Walker.

9. Taboga Island, June, 1911 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

Four males and five females. Subterminal line wanting; marginal shade widened at apex. Identified on the strength of a specimen from Jamaica, labeled by Mr. Schaus as compared at the British Museum, and of the accepted determination of North American specimens by Professor Fernald and others. The males are normal, the females very small, but seem correctly associated.

**PHLYCTÆNODES AUTOCRATORALIS** Dyar.

20. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, June (C. P. Crafts) and July, 1912 (J. Zetek, C. P. Crafts).

Nine males and eleven females. Subterminal line present, dentate, often confluent to marginal shade. Allied to the North American *mancalis* Lederer, but the markings darker and more distinct, the subterminal line nearer the margin. Mr. Schaus labeled all his Costa Rican material *mancalis*, including both this species and the preceding, but I am inclined to consider the forms as distinct.

**PHLYCTÆNODES BIFIDALIS** Fabricius.

4. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek), November, 1912 (C. P. Crafts).

**PAGYDA APONIANALIS** Druce.

*Pionea aponianalis* DRUCE, Biol. Cent.-Amer., Lep. Het., 1889, vol. 2, p. 557.

3. Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

This falls in *Pagyda* Walker by Hampson's tables. One specimen is a male and shows long and greatly swollen mid tibæ, with a groove concealing a hair-pencil.

**BÆOTARCHA EXOGRAMMALIS**, new species.

Reddish brown, the discal area semihyaline, followed by an oblique whitish band from outer fourth of costa to tornus; stigmata large, dark, of the ground color. Hind wing semihyaline whitish, with narrow red-brown outer border. Expanse, 27 mm.

*Type.*—Female, No. 16162, U.S.N.M.; La Chorrera, April, 1912 (Busck).

Allied to *B. stigmosalis* Warren.

**CONDYLORRHIZA VESTIGIALIS** Guenée.

46. La Chorrera, May, 1912 (Busck); Porto Bello, February, 1911.

Eleven of the yellow form; the majority are gray.

**NOORDA ESMERALDA** Hampson.

1. La Chorrera, April, 1912 (Busck).

**GONOPIONEA ASCHANALIS** Druce.

4. Trinidad River, March and June, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck).

**PIONEA BICOLORALIS** Guenée.

2. Corozal, Canal Zone, July, 1912 (C. P. Crafts); La Chorrera, April, 1912 (Busck).

**PIONEA SYLVIALIS Walker.**

1. Cabima, May, 1911 (Busck).

**PIONEA INCLUSALIS Walker.**

1. Trinidad River, March, 1912 (Busck).

**PIONEA EUPALUSALIS Walker.**

13. Taboga Island, February, 1912 (Busck).

**PIONEA TÆNIOALIS Guenée.**

19. Paraiso, Canal Zone, February, 1911 (Busck); Corozal, Canal Zone, April, 1911 (Busck), July, 1912 (J. Zetek, C. P. Crafts); Cabima, May, 1911 (Busck); Trinidad River, August, 1912 (Busck).

**PIONEA EXUVIALIS Guenée.**

3. Paraiso, Canal Zone, February, 1911 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**PIONEA LAGUNALIS Schaus.**

2. Trinidad River, March, 1912.

I do not detect any differences between this and a specimen in the collection labeled "*autoclesalis* Walk. = type, Oxf., *notaspis* Led."

**PIONEA VINOTINCTALIS Hampson.**

27. Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck); Cabima, May, 1911 (Busck); Taboga Island, January, 1911 (Busck); Corozal, Canal Zone, May, 1911 (Busck), July, 1912 (J. Zetek, C. P. Crafts).

**PIONEA BELIALIS Druce.**

6. Alhajuelo, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**PIONEA EXPLICALIS, new species.**

Straw-color, dusted with fuscous, forming a shade along margin of fore wing and covering all of hind wing but the costa; fringe doubly lined, appearing dark on both wings; costa narrowly dark; lines dark, the inner straight, slightly oblique; discal mark lunate; outer line denticulate, inbent above vein 2 to below reniform, then coarsely wavy to inner margin. Hind wing with the outer line running out close to margin, then far inward along vein 2 and arcuate to inner margin. Expanse, 16–20 mm.

*Cotypes.*—Male and female, No. 16167, U.S.N.M.; Trinidad River, June, 1912 (Busck), male; Corozal, Canal Zone, April, 1911 (Busck), female. Also two females, one from the same place as the male type, the others Cabima, May, 1911 (Busck).

**PIONEA STHENNYMALIS, new species.**

Dull reddish, the fringe yellow; lines slender, obscure, the outer far out, incurved along vein 2; discal mark small. Hind wing broadly whitish at base, the margin dull reddish and fringe yellow; a small dash across submedian fold. Expanse, 12 mm.

*Type.*—Male, No. 16168, U.S.N.M.; Cabima, May, 1911 (Busck). Also two others from Corozal, Canal Zone, July and November (C. P. Crafts).

Allied to *P. vinotinctalis* Hampson and *P. decetialis* Druce, nearest the latter but smaller and with pale base to the hind wing.

**PIONEA EPANTHISMA, new species.**

Straw-color, finely and densely irrorated with brown; lines lost in the general irroration except the outer, which is dark, punctiform, and excurved centrally nearly to outer margin, followed by pale points of the ground color; in some specimens a trace of inner line shows; discal mark lunate, faint; a row of terminal dark dots. Hind wing whitish at base, terminally straw-color or pale fuscous with terminal dots as on fore wing. Expanse, 16 mm.

*Type.*—Female, No. 16166, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also 10 others from the same place and Alhajuelo, April, 1911 (Busck); Corozal, Canal Zone, April, 1911 (Busck), July, 1912 (J. Zetek).

**PYRAUSTA MELLINALIS Hübner.**

1. Paraiso, Canal Zone, February, 1911 (Busck).

**PYRAUSTA INSIGNATALIS Guenée.**

18. Paraiso, Canal Zone, February, 1911 (Busck); Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek, C. P. Crafts); Cabima, May, 1911 (Busck).

**PYRAUSTA CATONALIS Walker.**

6. La Chorrera, May, 1911 (Busck); Corozal, Canal Zone, April, 1911 (Busck); November, 1912 (C. P. Crafts).

**PYRAUSTA MOPSALIS Walker.**

7. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Porto Bello, April, 1912 (Busck).

**PYRAUSTA FLAVIDALIS Guenée.**

1. La Chorrera, May, 1912 (Busck).

**PYRAUSTA ALIALIS Guenée.**

1. La Chorrera, May, 1912 (Busck). The identification is only provisional.

**PYRAUSTA RHODOCHROIA, new species.**

Fore wing dark rose-color, the lines fine, yellowish, denticulate; inner broken above median vein, outer broadly excurved above; a faint, dark, lunate discal mark; fringe fuscous; apex acute. Hind wing fuscous with a rose-colored patch on outer margin above submedian fold. Body fuscous, abdomen with white segmental rings. Expanse, 13 mm.

*Type.*—Female, No. 16163, U.S.N.M.; Corozal, Canal Zone, November, 1912 (C. P. Crafts). Also six others, same place and date.

**PYRAUSTA LIOPASIALIS, new species.**

Wings with the margins nearly parallel, apex and tornus rounded; bright straw-yellow, more or less suffused with brown-gray, sometimes completely; lines slender, brown, crenulate, the inner curved, the outer excurved centrally and approaching the outer margin; orbicular and reniform annular. In the pale forms the suffusion is reddish, in scattered patches; in darker ones the median space becomes solidly suffused; in the darkest ones the suffusion covers the whole wing uniformly, the lines being greatly obscured. Hind wing pale at base with brown or fuscous tip. Abdomen with a white dorsal patch at tip in the male only. Expanse, 27 mm.

*Type.*—Male, No. 16165, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also 11 others from the same place and date, except 2 which were taken June, 1912.

Very close to *P. rhodope* Hampson from Cuba, but much less red, of a clearer yellow ground, and generally larger.

**PYRAUSTA PLOIMALIS, new species.**

Whitish, creamy, more strongly tinged with brown along the margins; lines broad, blurred, with scattering of black scales over the wings and in patches especially at middle of outer margin and tornus of fore wing and apex of hind wing; a dot at base of costa and one in cell near base; inner line with a blunt tooth on median and vein 1; orbicular punctiform, reniform elliptical, solid; outer line excurved mesially, retracted to reniform, wavy to inner margin; terminal dots small. Hind wing with discal dot, outer line, and terminal dots as on fore wing. Expanse, 16 mm.

*Type.*—Male, No. 16164, U.S.N.M.; Corozal, Canal Zone, November, 1912 (C. P. Crafts). Also nine others from the same place, April, 1911 (Busck), and August, 1912 (C. P. Crafts).

**TEGOSTOMA DINICHEALIS Walker.**

3. Porto Bello, February, 1911, and April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**STENOPTYCHA PTEROPHORALIS Walker.**

3. Taboga Island, February, 1912 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**LINEODES MONETALIS Dyar (=DIANALIS Hampson).**

9. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck), June, 1912 (C. P. Crafts), July, 1912 (J. Zetek, C. P. Crafts); Porto Bello, December, 1912 (G. F. Cleveland).

**LINEODES VULNIFICA Dyar (=ENCYSTALIS Hampson).**

13.[1] Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek, C. P. Crafts).

**LINEODES MESODONTA Hampson.**

1. Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**LINEODES FONTELLA Hampson.**

4. Porto Bello, May, 1912 (Busck); Corozal, Canal Zone, November, 1912 (C. P. Crafts).

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[1] Four of the specimens are typical *vulnifica;* nine seem referable to *tridentalis* Hampson, but I doubt if the two forms are specifically distinct.

### Subfamily NYMPHULINÆ.

**DIATHRAUSTA NERINALIS Walker, form ANGUSTELLA Dyar.**

13. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, March, 1912 (Busck); Corozal, Canal Zone, March and April, 1911 (Busck), July, 1912 (C. P. Crafts, J. Zetek); Cabima, May, 1911 (Busck); Trinidad River, May, 1911 (Busck).

**PILETOCERA BUFALIS Guenée.**

125. Porto Bello, February, 1912 (Busck); Taboga Island, February, 1912 (Busck); La Chorrera, April, 1912, and May, 1911 (Busck); Corozal, Canal Zone, April, 1911 (Busck), July, 1912 (C. P. Crafts, J. Zetek), and November, 1912 (C. P. Crafts); Trinidad River, June, 1912 (Busck).

**PILETOCERA SIMPLICIALIS Barnes and McDunnough.**

15. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, April, 1911, and May, 1912 (Busck), June, 1912 (C. P. Crafts); La Chorrera, April, 1912 (Busck); Porto Bello, July, 1912 (Busck).

Smaller, darker, and narrower winged than *bufalis*, the male without fovea in the cell. One specimen from Costa Rica has been labeled *Stenia gelliasalis* by Mr. Schaus, but not correctly, I think.

**PILECOCERA STERCORALIS Möschler.**

33. Paraiso, Canal Zone, February, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July and November, 1912 (C. P. Crafts); Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck); Trinidad River, June, 1912 (Busck).

More or less ocher shaded, the wings more sharply pointed at apex than in *bufalis* Guenée. This name is given as a synonym of *bufalis* by Hampson, but I believe that two species are clearly indicated.

**STENIA COSTALIS Hampson.**

11. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**STENIA COLUBRALIS Guenée.**

1. Cabima, May, 1911 (Busck).

**STENIA PULVERALIS Druce.**

2. Cabima, May, 1911 (Busck).

**STENIA HYPHEROCHALIS, new species.**

Similar to *pulveralis* Druce, but smaller, the apices of both wings with a large blackish patch. Lines of hind wing well divided, forming two across the wing without trace of cross-line. Expanse, 15 mm.

*Type.*—No. 16173, U.S.N.M., selected from a series of fifteen; Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, March, 1912 (Busck).

**STENIA DECLIVALIS, new species.**

Similar to *S. gelliasalis* Walker, smaller, darker, the whitish outer line of hind wing distinct, sharply angled, touching the outer margin in its outmost angle, not rounded, indistinct, not more or less withdrawn from the margin as it is in *gelliasalis* from Brazil. Expanse, 13 mm.

*Type.*—No. 16174, U.S.N.M., selected from a series of eleven specimens; Taboga Island, February, 1912, and June, 1911 (Busck); La Chorrera, May, 1912 (Busck); Aroa, Venezuela (Schaus collection).

A larger race of this species from Costa Rica has been identified as *gelliasalis* by Mr. Schaus, but the markings of hind wing and the color agree with *declivalis*. A form of this species occurs in the West Indies, for which I propose the name **indianalis**, in which the markings are very faint, hardly legible on either wing. The hind wings have a whitish tint toward base. Expanse, 13 mm.

*Type.*—No. 16175, U.S.N.M., selected from 20 specimens, Santiago de Cuba, Cuba, June, 1902 (W. Schaus); Jamaica (Schaus collection); Culebra Island, Porto Rico, February, 1899 (A. Busck); Grenada, British West Indies (Schaus collection).

**STENIA ACUMINALIS, new species.**

A rather large form, brownish black shaded, with a slight ocherous tint, which comes out strongly on the costa in rubbed specimens; lines whitish, black edged, essentially as in *gelliasalis*. Hind wing black, whitish only on the costa, the lines as in *declivalis*, but softened and somewhat less contrasted. Expanse, 14 mm.

*Type.*—No. 16176, U.S.N.M., selected from nine specimens, La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts, J. Zetek); Sixola River, Costa Rica, September (W. Schaus).

The Costa Rican specimen was labeled *gelliasalis* by Mr. Schaus, but it shows the characteristic pointed fore wing of this species.

**STENIA ELECTALIS Walker.**

1. Trinidad River, March, 1912 (Busck).

**STENIA SAMEALIS, new species.**

Brown; fore wing with whitish markings, a patch at basal third cut by the median vein, a discal bar, a white band forming spots between the veins from subcosta to vein 1, cut by the narrow outer line, which is wavy and bends inward along vein 2 to below the end of the cell. Hind wing whitish with brown outer border; a dark mark in the cell, yellowish spot at the end encircled with brown; outer line as on the fore wing, dislocated at vein 2; fringe pale with basal and central lines. Expanse, 20 mm.

*Type.*—Female, No. 16177, U.S.N.M.; Corozal, Canal Zone, August, 1912 (C. P. Crafts). Also 8 from the same place, July, 1912 (J. Zetek), August and November, 1912 (C. P. Crafts), and 12 from French Guiana, March, April, June, July, and August, 1904 (W. Schaus), of which one is a male, without modification of the antennæ.

**NYMPHULA HERMEASALIS Walker.**

118. Taboga Island, February, 1912 (Busck); Paraiso, Canal Zone, April, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Porto

Bello, April, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (J. Zetek); Cabima, May, 1911 (Busck); Trinidad River, May, 1911, and June, 1912 (Busck); La Chorrera, May, 1912 (Busck); Arajan, 1911 (Busck).

**ARGYRACTIS HARPALIS Snellen.**

13. Alhajuelo, March, 1912 (Busck); Trinidad River, March and June, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**ARGYRACTIS NECOMALIS, new species.**

White; fore wing falcate, margin fulvous; a black dash at base of costa and inner margin and another dash on costa beyond (not a dot as in *harpalis*); a dull fulvous shade parallel to the oblique middle line, both toothed on subcosta; outer line strongly looped out in its upper third, the loop filled above and below with fulvous. Hind wing with markings as in *harpalis* with the addition of a large black blotch beyond the discal mark. Expanse, 10 mm.

*Type.*—Male, No. 16194, U.S.N.M.; Corozal, Canal Zone, August, 1912 (C. P. Crafts). Also four others, La Chorrera, May, 1912 (Busck); Porto Bello, April, 1912 (Busck); Alhajuelo, March, 1912 (Busck).

**ARGYRACTIS TICONALIS, new species.**

White; fore wing falcate, margin fulvous; a dot near base of costa; two on inner margin, the outermost the larger; inner line slender, irregular, blackish, nearly erect, with a faint inward duplication at costa; a blackish subapical triangle on costa with slender oblique line within it, narrowly joined to a large lunate mark before tornus. Hind wing (imperfect) with a black angled median half line and some black near the margin. Expanse, 10 mm.

*Type.*—Female, No. 16195, U.S.N.M.; Trinidad River, June, 1912 (Busck).

**CATACLYSTA HAMIFERALIS Hampson.**

18. Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, 1912 (C. P. Crafts); Porto Bello, March and April, 1911, and May, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**CATACLYSTA BIJONALIS, new species.**

Discal dot of fore wing solid, black, followed by yellow; costa nearly continuously brown shaded; inner line oblique, preceded by yellow, followed by white, which cuts the costal shade; anal area filled by a curved yellow line, inclosing two patches of gray scales; outer and submarginal dashes wedge-shaped, converging below; margin yellow, edged by fine dark lines. Hind wing with three yellow bands, the terminal black dots in double row, alternating. Expanse, 9 mm.

*Cotypes.*—Two females, No. 16178, U.S.N.M., La Chorrera, April, 1912 (Busck).

**CATACLYSTA ACLISTALIS, new species.**

White, very little yellow, the marks slender and open; costa brown with expansions at base, opposite inner line and about discal mark; inner line curved, slender, obsolete; a curved median line arising from inner margin and directed below discal dash; the latter open, white, with two parallel dark lines; outer dash not joining submarginal dash, both directed toward tornus, where is a small yellow dash above a gray streak; termen yellow, preceded and followed by fine gray lines. Hind wing white; a broken bent brown line across middle; a pale yellow patch beyond cell; apex broadly pale yellow; terminal dots nearly fused, mixed with metallic violet scales. Expanse, 14–16 mm.

*Cotypes.*—Two females, No. 16179, U.S.N.M., Taboga Island, February, 1912 (Busck). Also one female, Alhajuelo, March, 1912 (Busck).

**CATACLYSTA TRIUMPHALIS Schaus.**

60. Taboga Island, February, 1912 (Busck); Trinidad River, March and June, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Corozal, Canal Zone, April, 1912 (Busck); Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

The discal dot of fore wing is solid, brown, oblique.

**CATACLYSTA AUSPICATALIS Schaus.**

12. Porto Bello, February, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

Similar to *triumphalis*, but the discal dot of fore wing is pale, open, with a dark line on either side.

**CATACLYSTA GLYCYSALIS, new species.**

White; a brown-gray patch at base of costa; an inwardly oblique dark inner band, rather distinctly duplicated by a slender line, not quite parallel; a blotch on costa, oblique, inclosing the narrow yellow discal bar, to a yellow patch on tornus; submarginal band yellow-filled below; termen yellow, preceded by a dark line. Hind wing with upright yellow bar across cell, followed by a gray line; a broad yellow discal area; terminal black dots in three groups of three each, mixed with metallic violet scales and broken apical arc. Expanse, 13 mm.

*Cotypes.*—Male and female, No. 16180, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also 11 others from the same place and date except one, Corozal, Canal Zone, April, 1911 (Busck).

Specimens of this species were determined as *C. opulentalis* Lederer by Mr. Schaus from Costa Rican material, and they do not disagree markedly with specimens from French Guiana labeled by Mr. Schaus "*opulentalis* Lederer; *divisalis* Walk., in B. M." but from a specimen marked "*opulentalis* Led.; *divisalis* Walk.=type" they do differ, as that has the lower half of fore wing beyond outler line washed with yellow and a wide white space on hind wing before the terminal dots, which form but two groups.

**CATACLYSTA CABIMALIS, new species.**

Near *aclistalis*, the markings heavier and less open; yellow color deeper, that at anal angle of fore wing forming an arc. On hind wing the yellow is orange tinted and forms a large area touching the marginal dots. Expanse, 22 mm.

*Type.*—Female, No. 16181, U.S.N.M.; Cabima, May, 1911 (Busck).

**CATACLYSTA COMPLICATALIS, new species.**

Basal area of fore wing brown on costa, white below, with a yellow dash; inner line curved across wing, preceded by white; costa brown from thence to outer wedge-shaped mark; discal dot narrow, yellow, between two parallel dark lines; a sagittate dark mark above middle of inner margin; anal area yellow with a gray dash; subterminal wedge-shaped mark yellow-filled below; termen yellow, with dark lines bordering. Hind wing with a little gray near base of cell, slender median line, slight vacuolated yellow patch before the terminal black dots, which are fused, preceded by a broken black line and a distinct white space. Expanse, 15 mm.

*Type.*—Female, No. 16182, U.S.N.M.; Porto Bello, February, 1911 (Busck).

**CATACLYSTA BRUNNEODORA, new species.**

Similar to *C. triumphalis* Schaus, but heavily shaded with brown; base of hind wing brown, the outer white line of fore wing narrow. In the females the brown generally extends over most of fore wing; in males, a larger yellow area is left about anal angle. White space before the terminal spots of hind wing is wider than in *triumphalis*. Expanse, 13–19 mm.

*Cotypes.*—Male and female, No. 16183, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also 15 others with additional localities Trinidad River, June, 1912 (Busck); Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck).

**CATACLYSTA ARGYROLEPTA, new species.**

Similar to *C. peraltalis* Schaus, but the abdomen without the dark band at base and none or but a trace of dark color at base of hind wing. Brown costal area much reduced as compared with *peralatalis*, the wing largely overspread with deep yellow; discal mark oblique, white, between two parallel bars, the costa white, not dark beyond it. Hind wing largely deep yellow; two silvery white marks across the cell and near base of submedian; generally a small white space before the large, fused, terminal black spots. Expanse, 10–12 mm.

*Cotypes.*—Male and female, No. 16184, U.S.N.M.; Trinidad River, March and June, 1912 (Busck). Also 13 others from same place and

La Chorrera, May, 1912 (Busck); Porto Bello, March, 1911, and April, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts).

**CATACLYSTA IOLEPTA, new species.**

Fore wing with the basal area orange yellow, crossed by a straight subbasal line; a broad inner band, narrowing toward inner margin, cut by a white dash on costa; costa beyond gray, widening to a quadrate patch containing the pale, obscure discal dash; the rest of the wing orange yellow; an oblique outer white dash from costa, followed by a grayish triangle and a narrow white subterminal line, edged by fine dark lines; fringe gray; a metallic gray dash at tornus. Hind wing orange-yellow; two metallic violet dashes across cell; terminal spots large, condensed into three areas, each with a semicircular line within. Expanse, 14 mm.

*Type.*—Female, No. 16185, U.S.N.M.; Porto Bello, March, 1911 (Busck).

**CATACLYSTA UNILINEALIS, new species.**

Costa gray from base, apex white, crossed by a distinct dark gray oblique bar; inner area shaded with yellow; termen yellow; a gray dash at tornus. Hind wing irregularly yellow; terminal dots fused with a small space before them. Expanse, 7 mm.

*Type.*—Male, No. 16186, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**CATACLYSTA MIGNONALIS, new species.**

Fore wing broadly shaded with dark gray, solidly from base along costa, incompletely cut by a whitish inner line and outer dash; discal mark narrow, pale, oblique; some white before the yellow anal area, which is partly bounded by a broken dark arc; a slender white dash before the yellow termen, all bounded by slender dark lines. Hind wing broadly blackish shaded at the base, then yellow, cut by a white line; terminal dots somewhat irregularly placed in two rows on a violaceous ground, a small white space before. Expanse, 13–18 mm.

*Cotypes.*—Male and female, No. 16187, U.S.N.M.; Chiriquicito, April, 1907 (W. Schaus). Also four from same place and Chiriqui, May, 1907 (W. Schaus). Mr. Schaus collected a series of this species in Costa Rica, but he labeled the specimens *jalapalis* Schaus. From *jalapalis* (=*orizabalis* Schaus) the present species differs conspicuously in a number of characters. *C. mignonalis*, rather, is allied to *C. amathystina* Schaus, but that has the dark basal areas vacuolated with white. *C. jalapalis* has no dark basal area on the hind wing.

**CATACLYSTA SYMPHONALIS, new species.**

Fore wing nearly solidly blackish at base, followed by a white line, then a slender blackish one bent on submedian; median space whitish below, solidly blackish powdered on costa; outer line zigzag, followed by two white oblique areas above and one below; between the two upper is the oblique dark discal dash, sometimes prolonged and bent; following area dark to the white erect subterminal line; termen orange, separated by a slender line; fringe dark. Hind wing broadly blackish at base; then a white area traversed by a zigzag blackish line; apex black dotted with a concentric pale ring or loop; terminal black spots large, single, separated by metallic violet, without preceding white space. Expanse, 13 mm.

*Cotypes.*—Male and female, No. 16188, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also ten others from the same place and Paraiso, Canal Zone, June, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck).

Somewhat allied to *C. annulalis* Guenée.

**CATACLYSTA MULTIPICTA, new species.**

Similar to *symphonalis*, but with oval orange patches before tornus and in middle of submarginal costal wedge of fore wing and at anal angle of hind wing. Lines more oblique, the basal dark area cut by a pale line and blotched with orange. Hind wing with the looped line not inclosed among the subapical dots but preceding them. Expanse, 9–13 mm.

*Cotypes.*—Male and female, No. 16189, U.S.N.M.; Porto Bello, March, 1911 (Busck). Also six others from the same place.

**CATACLYSTA AUTOBELLA, new species.**

Fore wing with a dark patch at base, the median area finely lined and irrorated with black; apical area dull orange with two oblique convergent silvery half lines on costa; fringe dark; a leaden patch at tornus. Hind wing with numerous crooked black lines over the disk on a white ground; terminal black spots confluent, separated by violet and followed by little orange dots. Expanse, 12 mm.

*Type.*—Female, No. 16190, U.S.N.M.; Trinidad River, June, 1912 (Busck). Also 22 others from the same place and La Chorrera, May, 1912 (Busck); Cabima, May, 1911 (Busck).

Allied to *C. divulsalis* Walker.

**CATACLYSTA VACUOLATA, new species.**

Costa dark at base; inner line oblique, median zigzag, all confluent and dividing the base into five white areas and one orange one; apical half of wing orange, with two white convergent costal half lines; fringe dark; a leaden spot before tornus; hind wing with three straight black lines, one before, two beyond the orange, dark-edged discal spot; terminal dots small, uniform, followed by orange dots; an orange streak at tornus. Expanse, 10 mm.

*Type.*—Male, No. 16191, U.S.N.M.; Corozal, Canal Zone, June, 1912 (J. Zetek, No. 76). Also 26 others from the same catch and August and November, 1912 (C. P. Crafts); Cabima, May, 1911 (Busck).

**CATACLISTA DIALITHA, new species.**

Base of fore wing gray; inner band broad, white; median area gray powdered, with fine curved subcostal lines to discal dash, pale, between two parallel lines; subapical triangle dark, with a white line on each side; termen orange. Hind wing narrowly dark at base, then white; a naked orange discal mark, followed shortly by another; apical area with coarse black dots; a broad white area before the irregular, fused, terminal spots. Expanse, 9 mm.

*Type.*—Male, No. 16192, U.S.N.M.; Paraiso, Canal Zone, January, 1911 (Busck).

**CATACLYSTA ZELOTA, new species.**

White; fore wing with subbasal, inner and mesial lines pale fulvous, becoming blackish on costa, angled subcostally; outer line crumpled, visible only below; subapical triangle fulvous, short, edged within by blackish geminate submarginal line, which is excurved below and in-angled on submedian fold, preceded there by orange; termen orange; fringe dark. Hind wing with a fulvous line across the disk, slight fulvous shading outwardly; terminal spots doubled and preceded by short arcs, separated by metallic scales. Expanse, 11 mm.

*Type.*—Female, No. 16193, U.S.N.M.; Trinidad River, June, 1912 (Busck).

## PARAMBIA, new genus.

Palpi upturned, the third joint long and acuminate; maxillary palpi filiform, rather long; front rounded, not prominent. Fore wing with veins 8–11 stalked; hind wing with the margin excavated below apex and again very slightly before anal angle.

*Type of the genus.*—*Parambia gnomosynalis*, new species.

**PARAMBIA GNOMOSYNALIS, new species.**

Fore wing white at base; inner line blackish, faint, bounding the white area; median space irrorated with black, becoming fulvous on costa, but leaving a white area in the curve of outer line; discal mark black, clouded; outer line slender, black, denticulate, broadly excurved over cell; terminal space black-irrorate, with a patch near center of margin, dull fulvous at apex. Hind wing whitish at base; a black patch below cell, with a large hair-tuft; outer line black, slender, curved; terminal space black-filled, leaving a little pale line on each side; termen narrowly fulvous and blackish, between two slender black lines; fringe pale. Expanse, 13 mm.

*Type.*—Female, No. 16196, U.S.N.M.; Porto Bello, March, 1911 (Busck). Also seven females from the same place, April, 1912 (Busck); Taboga Island, February, 1912 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (C. P. Crafts). Males of the same, or a closely allied species from French Guiana, have the antennæ thickened to two-thirds their length, then suddenly narrowed and twisted.

**PARAMBIA GLENEALIS, new species.**

Close to *gnomosynalis*, but all the fore wing beyond the inner line shaded with fulvous brown; outer line and discal lunule black on the brown ground; a trace of white in the curve of outer line; terminal line black, strong. Hind wing with the shading brown, filling in beyond the cell as well as in terminal space. Expanse, 12 mm.

*Type.*—Female, No. 16197, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck). Also two females from Cayenne, French Guiana (W. Schaus).

**AMBIA FOVECOSTA, new species.**

Fulvous, blackish irrorate, marked with broad silvery white bands; subbasal and inner curved; a spot in cell with raised black dot on costal edge; discal dot black with a white streak beyond it; outer line curved around cell, dislocated, forming a cone in submedian space; subterminal line curved, forming an angle in submedian. Hind wing with the same markings as on fore wing, the inner lines wavy, the outer not broken but twice curved, the submarginal broken. Expanse, 10 mm.

*Type.*—Male, No. 16198, U.S.N.M.; Porto Bello, March, 1911 (Busck). Also one male, Trinidad River, March, 1912 (Busck).

**AMBIA FULVALIS, new species.**

Close to *fovecosta,* but clearer fulvous, the dark irrorations confined to the edges of the white bands; markings essentially the same, the subterminal area of hind wing broader, the white mark after the discal mark large. Expanse, 12 mm.

*Type.*—Male, No. 16199, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**AMBIA FUSCALIS, new species.**

Near *fovecosta,* but without fulvous, all fuscous brown between the lines; lines narrow, about half as wide as in the allied species, with essentially the same arrangement; discal dots of both wings blackish, without following white dash. Expanse, 11 mm.

*Type.*—Female, No. 16200, U.S.N.M.; Porto Bello, February, 1911 (Busck).

**AMBIA FULVITINCTALIS Hampson.**

1. Trinidad River, March, 1912 (Busck).

Agrees with a specimen from Costa Rica labeled "*Ambia fulvitinctalis* Hps., fide Hps." by Mr. Schaus, but the specimen does not agree very closely with the description.

**AMBIA FLAVALIS Warren.**

1. La Chorrera, May, 1912 (Busck).

A female, agreeing fairly well with two males from French Guiana, which are apparently conspecific with a labeled specimen from southern Brazil.

**AMBIA PAIGNIODESALIS, new species.**

White, much irrorated with blackish; a black patch at base of inner margin; inner line white, far out, sharply and lengthily angled on subcosta and submedian; discal mark white, lunular, between two black bars; outer line black and oblique above, running to outer margin, where there is a black spot on the fringe, then indistinctly and obliquely inward to its normal position; a row of terminal black dots; fringe grayish. Hind wing with a triangular black patch and tuft below the cell; outer line blackish, crenulate; terminal dots forming a spot on submedian and stain on the fringe at anal angle. Expanse, 11 mm.

*Type.*—Female, No. 17201, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also another female with the same label.

Allied to a species from southern Brazil labeled *Ambia albibasalis* Hampson by Mr. Schaus.

**AMBIA ENARERALIS, new species.**

White, dusted with black, very broadly and solidly so in outer half of median space; inner line curved, blackish, slender, indistinct; outer line far out, limiting the dark area, excurved above, then inward at vein 2, slightly excurved again below; subterminal line similar, parallel, evenly dividing the white marginal area; termen a little fulvous, with dots before and line beyond. Hind wing with diffuse shading below cell and a raised black tuft; outer line looped up on submedian; seven minute black dots on the lower half of margin in a fulvous band. Expanse, 12 mm.

*Type.*—Female, No. 16202, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also one female, Cabima, May, 1911 (Busck).

**AMBIA ENALLASSALIS, new species.**

Close to *enareralis*, but without black shading in outer half of median space; outer line broad above; subterminal line close to and parallel with outer line, not evenly dividing terminal space, but leaving a rather wide white apex. Hind wing with a broader leaden gray area before the seven dots; third joint of palpi longer and sharper than in *enareralis*. Expanse, 11 mm.

*Type.*—Female, No. 16203, U.S.N.M.; Corozal, Canal Zone, November, 1912 (C. P. Crafts). Also one female, Porto Bello, April, 1912 (Busck).

**AMBIA ENANTIALIS, new species.**

Close to the two preceding species, but entirely without black shading, hardly irrorate; a blackish discal spot; outer and submarginal lines parallel, curved. Hind wing with only an angular patch of black irrorations in center of disk; outer line far out, slightly angled only on submedian fold; terminal seven dots gathered in three pairs and one single, with a narrow gray preceding area; discal tuft of but few long black hairs. Expanse, 11 mm.

*Type.*—Female, No. 16204, U.S.N.M.; Trinidad River, May 1911 (Busck).

The type has lost the head, left front wing, and part of right hind wing, but the distinctive characters are obvious.

**OLIGOSTIGMA PROFUSALIS Schaus.**

2. Trinidad River, June, 1912 (Busck); Chiriquicito, April, 1907 (W. Schaus).

**OLIGOSTIGMA MOLLITALIS** Schaus.

2. Chiriquicito, April, 1907 (W. Schaus).

**OLIGOSTIGMA PURIFACTALIS**, new species.

Near *mollitalis* Schaus; subbasal line forming two yellowish patches across the wing; inner line far out, partly blackish, erect, straight; discal mark faint, yellowish; outer line double, of two black parallel lines above, single in its incurve to discal mark and below. Hind wing similarly marked; one fulvous discal line, two parallel outer ones, black on their costal segments. Expanse, 11 mm.

*Type.*—Female, No. 16205, U.S.N.M.; Porto Bello, April, 1912 (Busck).

**OLIGOSTIGMA SEMIMARGINALE**, new species.

Black; discal dot a shade darker; outer line faint, whitish, curved from costa to discal spot; subterminal line white, curved, forming a small spot above tornus; termen blackish. Hind wing with the subterminal line followed by a narrow even orange border, containing the terminal dots and fading toward apex. Expanse, 12 mm.

*Cotypes.*—Two males, No. 16206, U.S.N.M.; Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**OLIGOSTIGMA TIGRINALE**, new species.

Fulvous, powderly; lines white, slender, edged with purplish black scales; fore wing with the inner line curved, the outer making a sinus below cell; discal mark large, powdery, black and white; terminal line slender, like the others; fringe concolorous. Hind wing with the same lines, the outer without sinus, only flexuous. Expanse, 8 mm.

*Type.*—Female, No. 16207, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also one male, Corozal, Canal Zone, August, 1912 (C. P. Crafts).

**OLIGOSTIGMA ELECTRALE**, new species.

White; wings at basal third and thorax densely irrorated with dull purple; fore wing with the color extending up to cell, then an orange costal dash; beyond, three orange cuneiform dashes, one to apex, one to tornus, one between; small lines on costa representing the inner and outer lines. Hind wing with the whole base purple, crossed by two white lines; terminal area with six radiating orange streaks. Expanse, 11 mm.

*Type.*—Male, No. 16208, U.S.N.M.; Porto Bello, March, 1911 (Busck).

**AULACODES ŒCHMIALIS** Guenée.

2. Corozal, Canal Zone, April, 1911 (Busck); Paraiso, Canal Zone, May, 1911 (Busck).

**AULACODES REVERSALIS**, new species.

Black, with fine white lines; fore wing with the first line sharply angled, the second looped smoothly around it, third oblique, straight; costal triangle without white central wedge; subterminal band straight, short; terminal line slender. Hind wing with second and third lines with paler area between, the first three lines nearly straight and parallel; subterminal and terminal lines approximate, slender. Expanse, 10 mm.

*Type.*—Male, No. 16209, U.S.N.M.; Porto Bello, June, 1912 (Busck). Also three others from the same place and Trinidad River, June, 1912 (Busck).

Allied to *A. delicata* Schaus.

**AULACODES TRAVERSALIS, new species.**

First line broken, forming two long, parallel, longitudinal dashes; second line following, sharply angled; third line oblique, with a costal wedge before it; costal triangle with central wedge; subterminal and terminal lines similar; all lines distinct. Hind wing with four straight and two curved lines. Expanse, 10 mm.

*Type.*—Male, No. 16210, U.S.N.M.; Trinidad River, May, 1911 (Busck). Also two others with the same data.

Allied to *A. citronalis* Druce.

**AULACODES OBTUSALIS, new species.**

First line obsolete; second and third oblique, parallel, bent a little near inner margin; costal loop round, U-shaped; subterminal line single, broad, spotted, the other lines all very slender. Hind wing with three slender equidistant lines and traces of the marginal spotted one. Expanse, 11 mm.

*Type.*—Male, No. 16211, U.S.N.M.; Porto Bello, April, 1912 (Busck). Allied to *A. psyllalis* Guenée.

## HOMOPHYSODES, new genus.

Palpi upturned, fringed with scales in front, forming triangular tufts at the ends of first and second joints, third slender; maxillary palpi filiform, moderate; fronts rounded, not prominent. Hind wing evenly rounded. Antennæ with the shaft annulate.

*Type of the genus.—Homophysodes morbidalis*, new species.

This is only a *Homophysa* in which vein 10 of fore wing has become stalked with veins 8–9 instead of with 11; but the exigencies of our present classification require its removal to another subfamily and the erection of a new genus.

**HOMOPHYSODES MORBIDALIS, new species.**

Cream-colored; fore wing orange at base and apex and a blotch at end of cell; irrorated with purple over the rest of wing, intensified below apical spot and at tornus. Lines curved, crenulate, edged with blackish powderings, the outer excurved gently over cell. Hind wing pale along costa, powdered with blackish over the disk, with a faint paler outer line. Expanse, 10 mm.

*Type.*—Male, No. 16212, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also one male, two females from the same place and Corozal, Canal Zone, April, 1911 (Busck).

Much like *Homophysa cynalis* Dyar and *H. moribundalis* Dyar, previously described in this paper.

### ESCANDIA, new genus.

Tongue distinct; palpi upturned, the second joint expanded with scales at summit; third joint long, slender. Maxillary palpi minute, scale-like. Fore wing with veins 7–10 on a stalk arising long before apex of cell; outer margin shallowly excavate. Hind wing pointed subapically, the margin excavate below and thence coarsely wavy.

*Type of the genus.*—*Escandia fimbrialis*, new species.

**ESCANDIA FIMBRIALIS, new species.**

Fore wing shaded with pink at the base, followed by olive gray, brown and pink shades to the margin, leaving the inner margin broadly yellowish and pale; costa before apex nearly white; no lines or spots, except a little black along inner margin. Hind wing heavily marbled with black, the fringe with black spatulate scales; a white mesial band, broken centrally, with a little yellow beyond and followed by deeper black; a pale crenulate faint subterminal line. Expanse, 15 mm.

*Type.*—Female, No. 16213, U.S.N.M.; Corozal, Canal Zone, July, 1912 (C. P. Crafts). Also one female, Trinidad River, June, 1912 (Busck).

### Subfamily CHRYSAUGINÆ.

**SACCOPLEURA CATOCALIS Ragonot.**

2. La Chorrera, May, 1912 (Busck); Porto Bello, May, 1912 (Busck).

**GEPHYRA COSTINOTATA Schaus.**

11. Taboga Island, February, 1912 (Busck); Cabina, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Trinidad River, June 1912 (Busck); Corozal, Canal Zone, November, 1912 (C. P. Crafts).

**GEPHYRA POMPONIUS Druce.**

6. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

As identified by Mr. Schaus in Costa Rican examples. It is conspecific with *Salobrena tecomæ* Riley.

**SALOBRENA VACUANA Walker.**

11. Porto Bello, April, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Cabina, May, 1911 (Busck); Trinidad River, May, 1911 (Busck).

**SALOBRENA DICELA, new species.**

Fore wing with veins 7–10 stalked; two incisions in the costa. Dark purple-brown; fore wing with two very faint darker slender lines. Hind wing gray-brown; beneath with a broad black half-band on costa, shaded inwardly, edged outwardly by a whitish line. Expanse, 12 mm.

*Type.*—Female, No. 16277, U.S.N.M.; Trinidad River, May, 1912 (Busck). Also five others, three from the same place, one May, 1911 (Busck), and one Corozal, Canal Zone, August, 1912 (C. P. Crafts). Also one male in poor condition, the fore wing apparently lighter purplish, the lines more contrasted, the hind wing deep black above.

A specimen from Aroa, Venezuela, is labeled "*Salobrena excisana* Walk. fide B. M.," but Hampson figures and describes vein 10 from the cell in that species.[1]

## EOBRENA, new genus.

General characters of *Salobrena* Walker, but veins 10 and 11 of fore wing stalked.

*Type of the genus.*—*Eobrena melopoalis*, new species.

**EOBRENA MELOPOALIS, new species.**

Fore wing of the male with a tympanic vesicle at base of costa, the costa lobed and excavate beyond at middle. Purplish brown, the costa and a broad band beyond basal vesicle more or less distinctly orange-ocher; a white mark at costal incision and dots beyond; a white patch in the fringe below apex and above tornus; center of wing darker shaded. Hind wing with traces of a pale outer line. Expanse, 12 mm.

Female with the costa with a slight emargination at the middle; apex pointed; purple-brown; no orange markings; a white dash at costal incision and dots beyond; wing faintly transversely shaded. Expanse, 14 mm.

*Cotypes.*—Male and female, No. 16276, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also 20 males and 31 females from the same place and Porto Bello, May, 1912 (Busck); Tabogilla Island, February, 1912 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck); Cabima, May, 1911 (Busck); Trinidad River, March and June, 1912 (Busck).

In the series the size varies for males from 9–13 mm.; for females, 10–14 mm. The males vary in color, the orange markings being more or less distinct, sometimes absent; the females are quite uniform in color.

**TOSALE OVIPLAGALIS Walker.**

46. Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck); Chiriquicito, April, 1907 (W. Schaus); Tabernilla, Canal Zone May, 1907 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

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[1] Proc. Zool. Soc. Lond., 1890, p. 649.

### GEPHYRELLA, new genus.

Palpi porrect, straight, somewhat shaggy in the male, exceeding the head by its own length, smooth and gently downcurved in the female, rather longer than in the male; a long frontal tuft; costa convex beyond the middle; male with tympanic vesicle. Fore wing with veins 3, 4 from the cell, 4–5 stalked, distorted and appressed in the male; 6 from below the end of cell; 8 absent in the male, present in the female; 7–9 stalked, 10 and 11 on the cell; veins 7–11 distorted in the male. Hind wing with vein 2 from before the end of the cell, 4 absent, 3 and 5 from the drawn-out lower angle of the cell; 6 from the apex of cell; 7 anastomosing with 8.

*Type of the genus.*—*Gephyrella parsimonalis*, new species.

**GEPHYRELLA PARSIMONALIS, new species.**

Dark purple-brown, shining; fore wing with two very pale violaceous filiform lines, the inner curved, the outer wavily oblique; a minute white speck on costa in the emargination before apex; fringe touched with yellow. Hind wing black, the fringe touched with yellow; a short oblique obscure whitish streak before center of margin. Expanse, 8 mm.

*Cotypes.*—Male and female, No. 16273, U.S.N.M.; Alhajuelo, April, 1911 (Busck). Also 67 others from the same place and Corozal, Canal Zone, March, 1911, and May, 1912 (Busck); La Chorrera, May, 1912 (Busck); Porto Bello, February, 1912 (Busck); Taboga Island, February, 1912 (Busck); Paraiso, Canal Zone, January, 1911 (Busck).

The long series shows considerable variation. Some are a little larger or smaller, the range of expanse being 7–10 mm. In color the darkest are uniform purple-blackish without the yellow tint in the fringe; the lightest are red-brown, the color deepest at base and lighter in the discal field, sometimes resembling a patch of light color; these also without the yellow fringe.

**CASUARIA PURPUREA Schaus.**

1. Trinidad River, March, 1912 (Busck).

**SAMCOVA DAMIA Ragonot.**

5. Chiriquicito, April, 1907 (W. Schaus); Taboga Island, June, 1911 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July, 1912 (Busck).

### RESTIDIA, new genus.

Palpi and wing-shape of *Gephyrella*, but different in venation. Fore wing with veins 3–5 from the cell, straight, not distorted in the male; 6 from the end of the cell; 7–9 stalked, not distorted in the male; 10 and 11 from the cell, straight in both sexes. Hind wing with 2 to 5 from the cell, 4 present, 6 from the apex of the cell, 7 anastomosing with 8.

*Type of the genus.*—*Restidia ruha*, new species.

**RESTIDIA RUHA, new species.**

Male with the costal edge full and rounded at base over the tympanic vesicle, slightly emarginate beyond the middle; reddish brown, the vesicle dark; lines very faint, the outer most distinct, whitish, double, finely crenulate, gently excurved above middle. Hind wing gray-black. Beneath purplish, the hind wing with an outer pale line defined by dark. Expanse, 10 mm.

Female with the costa nearly straight; a very slight shallow emargination near the middle. Purplish, the lines less distinct than in the male, scarcely visible. Beneath more uniformly dark than in the male, the outer pale line of hind wing distinct. Expanse, 10 mm.

*Cotypes.*—Male and female, No. 16275, U.S.N.M.; male, Porto Bello, April, 1912 (Busck), female, Cabima, May, 1911 (Busck). Also 17 males and 40 females with additional localities Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck); November, 1912 (C. P. Crafts); Alhajuelo, April, 1911 (Busck); Paraiso, Canal Zone, January, 1911 (Busck); Trinidad River, May, 1911, March and June, 1912 (Busck); La Chorrera, May, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

The males vary in color from light red to a dark purple like the females. Range in size for males, 8–10 mm.; for females, 8–10 mm. The females are constant in coloration.

I possess specimens like these (except that veins 4–5 of fore wing are stalked) from Trinidad and French Guiana labeled "*Lepidomys fuscalis* Hampson, cotype ♂" [recte ♀], from Venezuela labeled "*Lepidomys cuprealis* Hampson, cotype ♂, type ♀," and one from Mexico with the same label (*fuscalis*, cotype male). In this latter, veins 4 and 5 of the fore wing are from the cell, as in the Panama specimens. *Lepidomys* Guenée[1] was described as a Noctuid and its single species, *L. irrenosa* Guenée was credited to New York. The name stood in our old lists, but I omitted it from Bulletin 52, United States National Museum, as the late Prof. J. B. Smith stated that it was not North American. Hampson did not include it in his papers on the Pyralinæ (1895–8), evidently having discovered that it was a Pyralid only subsequently to that date.[2] As the species *L. irrenosa* is unknown to me, I use the new name *Restidia*, which can be made a synonym if no differences appear. The names *fuscalis* and *cuprealis* of Hampson apply to the forms with veins 4–5 of fore wing stalked, to light and dark males on one species, in my opinion.

I have also specimens identified by Mr. Schaus as *Lepidomys lineosa* Druce (*Azamora lineosa* Druce[3]), one from Mexico, one from Costa Rica. They are not conspecific, and neither, perhaps, the true *lineosa* from Ecuador, but they appear from Guenée's description to be similar to *irrenosa.* If really related, and *irrenosa* proves structurally similar, they may be easily separated generically by the absence of vein 10 in fore wing, so that the genus *Restidia* will be justified.

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[1] Spec. Gen., vol. 6, 1852. p. 201.

[2] Ann. Mag. Nat. Hist. (7), vol. 17, 1906, p. 205.

[3] Idem, vol. 9, 1902, p. 328.

**LEPIDOMYS VIRIDANS Schaus.**

4. Tabernilla, Canal Zone, May, 1907 (Busck).

**LEPIDOMYS BILINEALIS, new species.**

Fore wing with vein 10 from the cell; 4 and 5 apart on fore wing, from a point or shortly stalked on hind wing. Dark purple-brown, with two slender white lines on fore wing, the inner straight, oblique across the wing, the outer coarsely wavy and retracted a little below costa. Hind wing purplish fuscous with outer whitish line, angled on submedian, faint toward costa. Expanse, 12 mm.

*Type.*—Female, No. 16306, U.S.N.M.; Trinidad River, May, 1911. (Busck). Also 13 others, all females, with additional localities, Porto Bello, February, 1911, and April, 1912 (Busck); Paraiso, Canal Zone, January, 1911 (Busck).

**LEPIDOMYS PLATYBATHYRALIS, new species.**

Fore wing with vein 8 absent; basal and terminal spaces pale olive brown, the basal space very wide; median space pale grayish, much paler than the rest of the wing, containing a dark discal dot and bounded by two dark lines, which are indistinctly relieved from the dark adjoining spaces. Hind wing pale fuscous. Male darker than the female throughout, the hind wing nearly black; fore wing dark olive with light mesial band. Expanse, male, 10 mm.; female, 12 mm.

*Cotypes.*—Male and female, No. 16305, U.S.N.M.; Corozal, Canal Zone, July, 1912, male (J. Zetek), female, April, 1911 (Busck). Also seven females from the same locality and Porto Bello, February, 1912 (Busck).

**HYPOCOSMIA BIMACULALIS, new species.**

Orange-red; fore wing purple at base and through inner half of median space; a white spot on costa at inception of each line; lines purple, single, the inner arcuate, accompanied faintly by white; outer excurved below costa, then oblique and straight; fringe dark. Hind wing dark orange with purplish outer line near the costa. Expanse, 17 mm.

*Type.*—Male, No. 16293, U.S.N.M.; Alhajuelo, April, 1911 (Busck).

Hampson gives this genus as having veins 4, 5 of fore wing separate, but in my specimens they are more commonly stalked. In the present species vein 7 arises before 9, whereas in H. *definitalis* Ragonot 7 arises after 9.

**HYPOCOSMIA RECTILINEALIS, new species.**

Fore wing with veins 4, 5 from the cell, 7–9 stalked, 7 arising before 9, 10 and 11 from the cell, free. Fore wing brown, with tint of olive at base and outer margin, shading to whitish next the outer line; median space dark brown filled outwardly, shading lighter next the inner line; lines white, narrow, straight, perpendicular, parallel. Hind wing blackish. Expanse, 18 mm.

*Cotypes.*—Male and female, No. 16292, U.S.N.M.; male, Cabima, May, 1911 (Busck); female, Porto Bello, April, 1912 (Busck).

**CARCHA VIOLALIS Hampson.**

2. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

Described from a female. In the male, the venation is very different; veins 4 and 5 are approximated at base, 6 below the angle of the cell, 7–9 stalked, 7 near the base of the stalk, 9 being near the apex, 10 and 11 on the cell, free; a flattened vesicle at base of costa.

**STHENOBAEA DYOPSATA Schaus.**

1. Cabima, May, 1911 (Busck).

Described as *Sanguesa*[1] but clearly belonging to *Sthenobaea.*

**ADENOPTERYX METALLESCENS, new species.**

Male with the venation of *A. conchyliatalis* Ragonot, except that veins 4, 5 of fore wing are long-stalked and 6–7 well stalked; glandular swelling at base of costa rather more elongate than in Hampson's figure[2]. Female with the venation unmodified, veins 4–5 stalked, 6–9 stalked, 10, 11 from the cell, 11 anastomosing shortly with 12.

Fore wing violaceous black with coppery reflection, roughly scaly, without markings, the apex downcurved and wrinkly. Hind wing black, squamose, with less metallic reflection. Expanse, male, 14 mm.; female, 18 mm.

*Cotypes.*—Male and female, No. 16274, U.S.N.M.; Cabima, May, 1911 (Busck). Also eleven males, one female, all from the same place but two, La Chorrera, May 1912, (Busck).

**HYPERPARACHMA RHODALIS Hampson.**

15. Corozal, Canal Zone, March, 1911 (Busck); Cabima, May, 1911 (Busck); Porto Bello, May, 1912 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, May, 1911 (Busck).

## ZAMANNA, new genus.

Front smooth, no tuft. Fore wing of the female with vein 3 before the end of the cell, 4 and 5 approximated at the base; 6 from upper angle; 7–9 stalked, 10, 11 on the cell. Hind wing with 2 and 3 free, 4 and 5 approximated at base. Male with the costa distorted, an emargination at end of cell with a fold on upper side beyond cell containing hairs; veins 6 and 7 approximated at base, 7–9 stalked, 8 absent, 10 and 11 from the cell, distorted. Palpi slender in the male, upturned to the middle of the front; shorter in the female, scarcely upturned, oblique.

*Type of the genus.—Zamanna dimorphalis,* new species.

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[1] Trans. Amer. Ent. Soc., vol. 30, 1904, p. 176.

[2] Proc. Zool. Soc. Lond., 1897, p. 672, fig. 45.

**ZAMANNA DIMORPHALIS, new species.**

Dark brown, slightly olive tinted; male with the distorted costa darker, especially the fold beyond cell; two slender, obscure, whitish lines, a little curved, especially the outer one above; discal and terminal dots clouded, a shade darker than the ground. A whitish line at base of fringe on both wings. Hind wing dark, uniform. Expanse, male, 14 mm.; female, 16 mm.

*Cotypes.*—Male and female, No. 16264, U.S.N.M.; Porto Bello, February and March, 1911 (Busck). Also 12 males and 3 females, all from the same place but two, Paraiso, Canal Zone, January and February, 1911 (Busck).

**ARICA SPLENDENS Druce.**

1. Trinidad River, March, 1912 (Busck).

**PARIDNEA MONOFLEXA, new species.**

Very similar to *P. holophaealis* Ragonot, but the inner line excurved on its middle third; also somewhat smaller and darker, brown color less reddish; fringe interlined with brown, the basal whitish line divided. Expanse, 25–27 mm.

*Cotypes.*—Three females, No. 16265, U.S.N.M.; La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**XANTIPPE SUAVIS Schaus.**

3. Porto Bello, April, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**XANTIPPE OLIVALIS, new species.**

Fore wing dark olive, easily fading to ocher, the termen rather broadly blackish shaded, persistent; two slender, nearly straight, pale, obscure lines; fringe yellow, touched with black and red at apex; costa narrowly black scaled. Hind wing blackish, the fringe with light basal line following a narrow dark terminal one, touched with red at apex; beneath, costa ocher and black; a red subcostal line; apex broadly dark red, the rest of the wing black. Hind wing whitish, broadly red along the costa; an outer pale line, farther from the margin apically. Expanse, male, 13 mm.; female, 15 mm.

*Cotypes.*—Male and female, No. 16266, U.S.N.M.; Taboga Island, January, 1911, and February, 1912 (Busck). Also one male and nine females, five from Taboga Island, five from Alhajuelo, April, 1911 (Busck).

The fore wing has vein 3 from the cell, 4–5 stalked.

**XANTIPPE ERNA, new species.**

Fore wing olive green with two slender, straight, obscure, whitish lines; costa very narrowly marked with red and black scales; a narrow, broken terminal black line; fringe whitish, black at tornus. Hind wing blackish, with pale line in base of fringe; below, fore wing black, with only a narrow red area along costa. Hind wing pale, gray-shaded, the costal fourth powdered with red; outer line pale, gray-edged, retracting from the margin at apex. Expanse, 12 mm.

*Type.*—Female, No. 16267, U.S.N.M.; Cabima, May, 1911. Also a male with the same data, in much poorer condition, but I think the same species.

**XANTIPPE GERTRIA, new species.**

Fore wing olive green with two faint, pale lines; costa narrowly black, both the lines forming minute dots; termen a little browner; a marginal broken black line; fringe pale orange, except at apex and tornus. Hind wing blackish. Below without any red; fore wing all black but the fringe; hind wing black-powdered, the outer curved pale line defined by black on both sides. Expanse, 12 mm.

*Type.*—No. 16268, U.S.N.M.; Cabima, May, 1911 (Busck).

**XANTIPPE TRUDIE, new species.**

Fore wing brownish ocher, shading to crimson-brown on the margin; costal edge crimson; terminal black line broken into spots; fringe orange-yellow centrally. Hind wing black; a pale yellowish line in the base of the long fringe. Below, fore wing black; costa narrowly ocher with red powdering; terminal line black; fringe as above. Hind wing pale, sordid, the costa broadly washed with reddish; outer line pale, with black inner edge. Expanse, 11 mm.

*Type.*—Female, No. 16269, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**XANTIPPE TRESCA, new species.**

Fore wing crimson-brown with two fine, illy defined, ocher lines; a terminal row of black dashes; fringe pale yellow, red at apex, black at tornus. Hind wing sordid, pale, the costal third red-powdered; outer line curved, pale, darked-edged. Expanse, 13 mm.

*Type.*—Female, No. 16270, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Fore wing with vein 3 shortly before the end of the cell, 4–5 stalked.

## CRAFTSIA, new genus.

Palpi upturned to slightly above vertex, smoothly scaled, pointed; front rather smoothly scaled. Fore wing with veins 3 and 4 absent, cell open, 6 from the end of cell, 7–10 stalked, 7 arising beyond 10, 8 absent, 11 free. Hind wing with 2 before the end of the cell, 3–5 stalked, 4 absent, 6 and 8 stalked, 7 and 8 coincident.

Named in honor of Mr. C. P. Crafts, who contributed to the collections here listed.

*Type of the genus.*—*Craftsia vaetta*, new species.

**CRAFTSIA VAETTA, new species.**

Red-brown; fore wing with two faint, pale lines, the inner angled on median vein, the outer excurved a little subcostally; costa and apex somewhat more heavily scaled. Hind wing whitish, stained with red-brown, especially at apex; a distinct fold submedianly, reaching the margin close below the end of vein 2, at a dark-brown mark. A stiff pencil of dark ocher-brown hairs lies along subcosta. Expanse, 11 mm.

*Type.*—Male, No. 16272, U.S.N.M.; Corozal, Canal Zone, November, 1912 (C. P. Crafts). Also two females, presumably the same, but of such fresh color as to appear quite different from the faded male, Corozal, Canal Zone, April, 1911 (Busck); La Chorrera, May, 1912 (Busck).

Apparently closely allied to *Chenevadia huralis*, but the venation of fore and hind wings curiously transposed.

### CHENEVADIA, new genus.

Palpi upturned about to vertex, third joint smooth, long, second with scales beneath. Fore wing with vein 2 from the end of the cell, 3–5 stalked, 4 absent, 6 from the upper angle of cell, 7–10 stalked, 7 arising beyond 9, 11 anastomosing with 12. Hind wing with 3 and 4 absent, cell open, 6 from the upper angle of cell, 7 anastomosing with 8.

*Type of the genus.*—*Chenevadia huralis*, new species.

**CHENEVADIA HURALIS, new species.**

Red-brown; fore wing shading to fuscous at apex; two pale, slender lines, the inner irregular and toothed on median vein, the outer incurved subcostally. Hind wing washed with pale toward base; an inner area of modified yellow androconia in a patch in the cell and in a long groove along submedian; a long yellow pencil subcostally, lying parallel to costa and having its origin near base of both hind and fore wing. Expanse, 13 mm.

*Type.*—Male, No. 16271, U.S.N.M.; Trinidad River, June, 1912 (Busck). Also six males from the same place and Cabima, May, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

**PARACHMA METERYTHRA Hampson.**

2. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**PARACHMA FERVIDALIS, new species.**

Fore wing red, brownish crimson, with two nearly straight, pale, diffused lines a row of terminal black dots; fringe like the general color. Hind wing blackish. Expanse, male, 9 mm.; female, 10 mm.

Fore wing with veins 3–5 stalked, 4 present, 7–10 stalked, 9 absent.

*Cotypes.*—Male and female, No. 16295, U.S.N.M.; Porto Bello, April, 1912 (Busck). Also one male and nine females from the same place, May, 1912 (Busck) and La Chorrera, May, 1912 (Busck); Taboga Island, February, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, April, 1912 (Busck).

**PARACHMA TARACHODES, new species.**

Venation variable in the fore wing: (1) female, 2, 3 well spaced, 3 from end of cell, 4–5 shortly stalked; (2) female, similar but 3 shortly before end of cell; (3) male, 3 shortly stalked on stem of 4–5; (4) male, 2 and 3 approximate before end of cell, 4, 5 separate; vein 7 present, stalked with 8–10. Hind wing with 3 absent, 4 and 5 seeming stalked but really separate, borne on the long-pointed narrow lower angle of the cell.

Fore wing light purplish in basal and terminal spaces, median area darker brown, bounded by the two pale, nearly straight lines; costa with interrupted black line, resembling the black terminal dashes; fringe light purplish. Hind wing light fuscous, with distinct terminal dashes and a line in the fringe. Below, washed with fuscous. Expanse, 15 mm.

*Type.*—Male, No. 16297, U.S.N.M.; Porto Bello, April, 1912 (Busck). Also one male, two females from the same place and La Chorrera, May, 1912.

## TOROTAMBE, new genus.

Palpi downcurved, about one and a half times the length of the head, rather thickly scaled. Fore wing with veins 2 and 3 before end of cell, 4, 5 from a point, 6 before apex of cell, 7–10 stalked, 7 arising beyond 9, 11 free. Hind wing with 2, 3 before end of cell, 4–5 stalked, 6 shortly stalked, 7 anastomosing with 8.

*Type of the genus.*—*Torotambe mirabella*, new species.

**TOROTAMBE MIRABELLA, new species.**

Fore wing with the costa arched beyond base, the apex a little produced and turned upward; violaceous, with olive-brown markings; a spot on costa at basal third; a band from apex, containing a round white spot on vein 6, widening below and shading off; a lunate patch at end of cell. Hind wing straw-color, a little fuscous tinted outwardly.

*Type.*—Male, No. 16290, U.S.N.M.; La Chorrera, May, 1912 (Busck).

## DEOPTERYX, new genus.

Fore wing with the venation distorted, the cell involved in the distortion; 2–3 stalked, 4–5 stalked, bent down at origin and approximated to 2–3; 6–7 distant from 4–5, approximated at base and bent downward; 7–9 stalked, distant; 8 absent; 10 and 11 free, arising from the cell, somewhat crumpled. Costa with an oval swelling at the base, incised and folded at middle, with long curved tufts of hair on the upper side over the cell. Hind wing with vein 2 near the middle of the cell, 4–5 free, arising close together from the produced lower angle of the cell, 6 from the upper angle of the cell, 7 anastomosing with 8. Palpi upturned, short, blunt, reaching the middle of the front; hairs of front long, appressed, directed downward.

*Type of the genus.*—*Deopteryx hypenetes,* new species.

**DEOPTERYX HYPENETES, new species.**

Dark brown, scarcely metallic, the curved tufts over the cell purplish; no markings except a dark terminal line. Hind wing of the same color, not metallic. Expanse, 19 mm.

*Type.*—Male, No. 16291, U.S.N.M.; Cabima, May, 1911 (Busck). Also four males from the same place.

**GALASA MONITORALIS, new species.**

Dark purplish, blackish irrorated; inner line whitish, acutely angled subcostally and at vein 1; outer line excurved, pale, faint; traces of a dark inner discal dot. Hind wing subtranslucent fuscous, a little paler at base, especially in males. Expanse, male, 11 mm.; female, 14 mm.

*Cotypes.*—Male and female, No. 16278, U.S.N.M.; Porto Bello, April and May, 1912 (Busck). Also four males and five females with additional localities, Cabima, May, 1911 (Busck) and Trinidad River, May, 1911, and March, 1912 (Busck).

**GALASA SUBPALLIDALIS, new species.**

Dark purplish, the basal space darker; inner line obscure, showing a distinct white angle on vein 1; outer line dark, clouded, far out; a little whitish on the costa in the incisions. Hind wing pale whitish, dark only in the terminal line and hairs of inner margin; in female, fuscous shaded on outer half. Expanse, male 11 mm.; female 12 mm.

*Type.*—Male, No. 16279, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also three males, one female with additional locality Porto Bello, March and May, 1911 (Busck).

**GALASA FERVIDALIS, new species.**

Fore wing brownish orange along costa to the middle, spreading downward in the center nearly to vein 1, shading into deep purple on inner half. Hind wing light fuscous, the veins and margin darker. Expanse, 18 mm.

*Type.*—Female, No. 16280, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also another female, Cabima, May, 1911 (Busck).

**GALASA LOPHOPALIS, new species.**

Purplish brown with a tint of luteous; lines narrow, obscure, whitish, dentate, accompanied by dark shadings, which give to median space a pale appearance; some white scales in the costal emargination; outer line excurved above; a row of terminal black dots. Hind wing subtranslucent fuscous, the veins darker. Expanse, 16 mm.

*Type.*—Female, No. 16281, U.S.N.M.; Cabima, May, 1911 (Busck).

**GALASA BELLICULALIS, new species.**

Fore wing vinous red, the median venules and vein 1 scaled with black, forming dots in the place of the outer line; a black dot in center of cell; white scaling along costa and inner margin narrowly; a row of terminal black dots in a narrow pale line. Hind wing pale fuscous, darker outwardly, with fuscous marginal line. Expanse, 12 mm.

*Type.*—Female, No. 16282, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck).

**GALASA LUTEALIS, new species.**

Luteous, dusted with gray, the dustings forming edgings, defining the lines as of the pale ground, the inner oblique, dentate, the outer excurved above; the irrorations form vague dots before the outer line and sometimes a shade in the median space along inner margin; a row of terminal black dots; a dark discal dot in the cell. Hind wing pale fuscous in the male, darker in the female. Expanse, male, 14 mm.; female, 16 mm.

*Cotypes.*—Male and female, No. 16283, U.S.N.M.; La Chorrera, May, 1912, male (Busck); Cabima, May, 1911, female (Busck). Also three males and four females with additional locality, Porto Bello, March, 1911 (Busck), October, 1912 (G. F. Cleveland).

**GALASA STRENUALIS, new species.**

Uniform purplish red, faintly orange tinted along costa; a terminal row of white points in the pale, narrow, terminal line. Hind wing fuscous, uniform. Expanse, 16 mm.

*Type.*—Female, No. 16284, U.S.N.M.; Porto Bello, April, 1912 (Busck). Also two females, Cabima, May, 1911 (Busck).

**GALASA STYGIALIS, new species.**

Fore wing dark fuscous, the lines formed of white dots on the veins, rather sparsely placed; terminal pale line nearly obsolete. Hind wing subtranslucent fuscous, a dark dash on submedian below vein 2. Expanse, male, 14 mm.; female, 16 mm.

*Cotypes.*—Male and female, No. 16285, U.S.N.M.; Tabernilla, Canal Zone, May, 1907 (Busck). Also one male and one female with the same data. One of the males has veins 4–5 of fore wing coincident instead of long-stalked, but agrees entirely in coloration.

**GALASA RELATIVALIS, new species.**

Fore wing purplish luteous, dusted with gray, defining two rather broad lines of the pale ground color, the basal space uniformly dusted, appearing darker; a spot in the cell near inner line; a terminal row of dark dots. Hind wing fuscous, veins dark, fringes pale. Expanse, 15 mm.

*Type.*—Female, No. 16286, U.S.N.M.; Cabima, May, 1911 (Busck).

Allied to *lutealis* in markings and the anastomosis of veins 11 and 12 of fore wing, which I notice only in these two species, but with one vein less in the hind wing.

**GALASA PALLIDALIS, new species.**

Straw-color, with a little purplish shading, the lines vague, of the pale ground, but without distinct defining shades; black dots on the veins, especially in cell and central costal lobe and before the bend in the outer line; a row of terminal black dots. Hind wing pale, washed with fuscous outwardly, especially in a streak along submedian fold and terminal dashes. Expanse, 15 mm.

*Type.*—Male, No. 16287, U.S.N.M.; Trinidad River, June, 1912 (Busck). Also one male, Porto Bello, April, 1912 (Busck).

**GALASA DUBITALIS, new species.**

Dark purple-brown, becoming blackish on inner margin; lines obsolete; scaling a little paler along the submedian fold; terminal pale line very narrow. Hind wing fuscous-black, uniform; a pale line in base of fringe. Expanse, 14 mm.

*Type.*—Male, No. 16288, U.S.N.M.; Cabima, May, 1911 (Busck).

Very close to *caustalis* Hampson, but with dark hind wings. The female specimens I have referred to that species.

**GALASA CAUSTALIS Hampson.**

4. Trinidad River, June, 1912 (Busck); La Chorrera, May, 1912 (Busck); Porto Bello, April, 1912 (Busck).

**GALASA DILIRIALIS, new species.**

Fore wing with the basal space purple-brown, median space pinkish, thickly irrorate with purple-brown, terminal space similar on tornus, orange at apex and purple-brown next to the outer line; lines whitish, the inner curved, the outer bent on median vein; a round black discal dot in center of cell; a row of terminal black dots; fringe purple-brown. Hind wing fuscous, with terminal black line, the fringe touched with purple. Expanse, 11 mm.

*Type.*—Male, No. 16289, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**HYALOSTICTA OBLIQUALIS Hampson.**

5. Porto Bello, March, 1911 (Busck); Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek), August, 1912 (C. P. Crafts).

## REPLICIA, new genus.

Palpi porrect, downcurved, extending about twice the length of the head. Fore wing with veins 2 and 3 rather approximate, from long before the end of the cell, 4–5 connate, 6 from upper angle of cell, 7–9 stalked, 7 arising before 9, 10 and 11 shortly stalked. Hind wing with 2 and 3 before the end of the cell, 4–5 stalked, 6 from upper angle of the cell, 7 anastomosing with 8.

*Type of the genus.*—*Replicia inchoalis*, new species.

**REPLICIA INCHOALIS, new species.**

Fore wing with the costal lobe on basal third, followed by two small incisions; blackish, shading to purple-brown at apex; a whitish irregular marking at the end of the cell, touching the incision following the costal lobe, where are some yellowish scales. Hind wing fuscous black. Expanse, 13 mm.

*Type.*—Female, No. 16294, U.S.N.M.; Cabima, May, 1911 (Busck).

**ACUTIA XANTIPPE, new species.**

Fore wing of normal shape, not sharply acute at apex; straw-yellow, thickly irrorate with crimson-brown; costal edge and two lines of this color, the inner one straight and a little oblique, the outer slightly flexuous and divergent on inner margin; fringe dark. Hind wing immaculate straw-yellow. Expanse, 12–13 mm.

*Cotypes.*—One male, two females, No. 16298, U.S.N.M.; Cabima, May, 1911 (Busck).

**ACUTIA AMBLYTALIS, new species.**

Fore wing purplish with slender dark lines defined by pale borders; inner line straight, oblique, outer indented subcostally and broadly on submedian; a terminal dark line. Hind wing blackish fuscous with a pale line at base of fringe. Expanse, 12–14 mm.

*Cotypes.*—Two males, one female, No. 16299, U.S.N.M.; Trinidad River, September, 1912 (Busck).

**ULIOSOMA RHODOESIS, new species.**

Venation of *U. discoloralis* Walker except that vein 7 is stalked with 8–9. Abdominal tufts and those on tibiæ ocherous. Fore wing yellowish, shaded with rosy; lines yellowish, straight, but a little indented, bordered with deep rosy toward the center of the wing; margin rosy shaded; a dark rosy terminal line. Hind wing pale, with rosy tint at apex and a rosy mesial line, most distinct costally. Expanse, 9 mm.

*Type.*—Male, No. 16296, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also another male, Porto Bello, April, 1912 (Busck).

**CAPHYS TITANA Schaus.**

1. Paraiso, Canal Zone, February 1911 (Busck).

**CAPHYS BILINEA Walker.**

25. Paraiso, Canal Zone, January, 1911 (Busck); Taboga Island, February, 1912 (Busck); Trinidad River, March and June, 1912, May, 1911 (Busck); Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck), November, 1912 (C. P. Crafts); Cabima, May, 1911 (Busck).

**CAPHYS EUSTELECHALIS, new species.**

Fore wing with vein 3 stalked with 4–5; 6 stalked with 7–10. Rosy; fore wing irrorated with fuscous evenly and with two dark lines, rather near together, parallel above, diverging roundedly above inner margin. Hind wing rosy, darker outwardly, a gray shade on the margin. Beneath sordid rosy, hind wing pale on inner margin; a double dark outer line on costal segment. Expanse, 11 mm.

*Type.*—Male, No. 16300, U.S.N.M.; Alhajuelo, April, 1911 (Busck).

**CAPHYS SUBSORDIDALIS, new species.**

Fore wing with vein 11 shortly anastomosing with 12; hind wing with the lower angle of the cell long drawn out, 4–5 stalked from its end. Fore wing dull purple-brown, thickly and finely irrorate over straw-color; lines straw-color, rather broad, the inner straight, the outer bent a little above the middle. Hind wing whitish, dusted with purplish fuscous, especially along the costa and apex. Expanse 22 mm.

*Type.*—Female, No. 16301, U.S.N.M.; Taboga Island, February, 1912 (Busck).

**ACROPTERYX HERBACEALIS Ragonot.**

3. Porto Bello, February, 1912 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

### OCOBA, new genus.

Palpi downcurved, reaching four times the length of the head, smooth, with short rough hairs at the base above. Fore wing with vein 2 beyond the middle of the cell, 3 before the angle, 4 and 5 separate, 6 from the upper angle, 7–9 stalked, 8 absent, 10 and 11 from the cell, 11 anastomosing with 12. Hind wing with 2 to 6 as on fore wing, 7 anastomosing with 8.

*Type of the genus.—Ocoba melanophila,* new species.

**OCOBA MELANOPHILA, new species.**

Fore wing black, shining, with purple reflection, the apex bent down. Hind wing duller, fuscous along the costa. Expanse, 18 mm.

*Type.*—Female, No. 16304, U.S.N.M.; Cabima, May, 1911 (Busck). Also one female, Porto Bello, October, 1912 (G. F. Cleveland).

Greatly resembles *Nachaba nyctalis* Hampson, but in that species veins 4–5 are stalked and the palpi of the female are not over half as long.

**STREPTOPALPIA DEERA Druce.**

28. Corozal, Canal Zone, April, 1912 (Busck), July, 1912 (C. P. Crafts); Trinidad River, March and June, 1912 (Busck); Cabima, May, 1911 (Busck); Porto Bello, April and May, 1912 (Busck), September, 1912 (G. F. Cleveland); La Chorrera, May, 1912 (Busck).

**NAVURA LOBATA Schaus.**

1. Trinidad River, May, 1911 (Busck).

**BONCHIS MUNITALIS Lederer.**

10. Taboga Island, February, 1912 (Busck); Porto Bello, April, 1912 (Busck); Chiriquicito, April, 1907 (W. Schaus); Tabernilla, Canal Zone, May, 1907 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, March and May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**BONCHIS GLANYSIS, new species.**

Hind wing with veins 4 and 5 stalked. Fore wing purplish brown, with two approximate, slender, white lines, the inner nearly straight, the outer inflexed a little subbasally, both a little stronger on the costa; a terminal row of black dots. Hind wing dark fuscous. Expanse 11 mm.

*Type.*—Female, No. 16302, U.S.N.M.; Porto Bello, April, 1912 (Busck).

**PELASGIS GEROMALIS, new species.**

Fore wing with vein 10 shortly stalked with 7–9; hind wing with 4–5 stalked. Fore wing dull ocher (faded from olive green?), the inner line at the middle of the wing, the outer at the outer fourth, the space between them pinkish gray, powdered with black outwardly; lines whitish, the inner across an obscure pale spot in the cell, angled on median vein and edged with blackish there; outer line gently curved, covered by black powderings except at costa and margin. Hind wing fuscous shaded, the veins and discal dot darker. Expanse 13 mm.

*Type.*—Female, No. 16303, U.S.N.M.; Cabima, May, 1911 (Busck).

**MURGISCA DIPLOMMATALIS, new species.**

Dark olive; a large white spot in the cell, joining another below, larger, reaching to vein 1; lines slender, white; inner line crinkled on costa, running into the spots, appearing below to join the outer line on the margin; outer line evenly curved, parallel to the margin, forming a dash on costa. Hind wing fuscous, becoming black on the margin; a small dark discal dot. Expanse, 18–20 mm.

*Cotypes.*—Three females, No. 16307, U.S.N.M.; Trinidad River, June, 1912 (Busck); La Chorrera, May, 1912 (Busck.)

**SENNIA AURITALIS Hübner.**

14. La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, June (Busck), and August, 1912 (C. P. Crafts).

**SENNIA SUBAURITALIS Ragonot.**

1. Cabima, May, 1911 (Busck).

**CYCLOPALPIA MONOTONALIS, new species.**

Fore wing pale yellowish with purple irrorations, that segregate and define rather broad lines of the ground color; inner line near base and slightly oblique; outer line straight and far from the margin; a round dot at the end of the cell. Hind wing pale stramineous. Expanse, 14 mm.

*Type.*—Male, No. 16310, U.S.N.M.; Taboga Island, February, 1912 (Busck).

## PASSELGIS, new genus.

Palpi porrect, downcurved, three times as long as the head, rostriform, the third joint with long appressed hairs. Fore wing with veins 4–5 stalked, 7–10 stalked, 11 from the cell, anastomosing with 12. Hind wing with vein 2 from the cell, 3 from the end of the long lower angle, 4–5 stalked, 6 from apex of cell, 7 anastomosing with 8.

*Type of the genus.*—*Passelgis xanthothricalis*, new genus.

**PASSELGIS XANTHOTHRICALIS, new species.**

Rufous, a deeper, more crimson tint at apex and purplish along the inner margin; discal dot round, slaty black; lines faint, purple, remote and far from margin, evenly curved, subparallel to the outer margin and rather more strongly curved than it. Hind wing straw-whitish, purple-shaded along the margin and costa. Expanse, 29 mm.

*Type.*—Female, No. 16308, U.S.N.M.; La Chorrera, May, 1912 (Busck).

### CONOTAMBE, new genus.

Palpi porrect, reaching to the end of the large, angular, pointed frontal cone. Fore wing with veins 4–5 stalked, 6 from the end of the cell, 7–10 stalked, 11 from the cell, free. Hind wing with 2 and 3 present, 4–5 stalked, 8 from end of the cell, 7 anastomosing with 8. Legs with the tibiæ and tarsi, especially the hind pair, greatly thickened and flattened.

*Type of the genus.*—*Conotambe paralysisalis*, new species.

**CONOTAMBE PARALYSISALIS, new species.**

Fore wing dark purple-red, the lines darker, very faint and clouded, hardly legible: outer line remote from the margin, curved. Hind wing shaded with black, except a patch between veins 2–5, which is purple-red, crossed by a mesial faint dark dentate line. Expanse, 34 mm.

*Type.*—Female, No. 16309, U.S.N.M.; Cabima, May, 1911 (Busck).

## Subfamily SCHOENOBIINÆ.

**SIGA PYRONIA Druce.**

1. Paraiso, Canal Zone, May, 1911 (Busck).

**CACOGRAPHIS OSTEOLALIS Lederer.**

15. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, July (J. Zetek), August and November, 1912 (C. P. Crafts).

**MIDILA CARNEIA Druce.**

3. Porto Bello, March, 1911 (Busck); La Chorrera, May, 1912 (Busck).

### DISMIDILA, new genus.

Proboscis absent: labial palpi ascending, the second joint hairy below, the third thickened with short hairs, blunt. Fore wing with veins 8–9 stalked, the rest from the cell. Both wings with a projection on outer margin at vein 3.

*Type of the genus.*—*Dismidila atoca*, new species.

**DISMIDILA ATOCA, new species.**

Lilacine gray; fore wing with two slender darker irregular lines, subparallel to the outer margin; costa white centrally, cut by both lines; a white semihyaline constricted patch in the end of the cell and a small one below the reniform, which is brown-ringed and yellow-centered; a black clouded patch follows; fringe pale, spotted with dark. Hind wing with two slender outer lines, crenulate, close together and near the margin; a small round discal dot. Expanse, 24 mm.

*Type.*—Male, No. 16313, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Allied to *Midila halia* Druce from Colombia, which has the same venation as the present species.

**HOSITEA BICINCTA Schaus.**

1. Trinidad River, June, 1912 (Busck).

**RUPELA ALBINELLA Cramer.**

24. Porto Bello, May, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, August, 1913 (C. P. Crafts).

**PATISSA PARVIPUNCTALIS Schaus.**

10. Cabima, May, 1911 (Busck); Corozal, Canal Zone, July, 1912 (Busck), and November, 1912 (C. P. Crafts).

**PATISSA ONIROPHANTA, new species.**

White; costa dark brown to near the middle, with three teeth, the outer giving rise to the inner line; lines pale brown; the inner broad, straight, the outer also broad, gently waved; some pale brown irrorations in terminal space and a large discal spot confluent with the upright outer band from costa to beyond tornus; a submarginal half-band from costa to middle of outer margin. Expanse, 9 mm.

*Type.*—Male, No. 16312, U.S.N.M.; Porto Bello, April, 1912 (Busck). Also 2 males, 5 females with localities, Cabima, May, 1911 (Busck); Corozal, Canal Zone, August and November, 1912 (C. P Crafts).

**CRYPTOSES CHOLŒPI Dyar.**

33. Taboga Island, February, 1912 (Busck); Alhajuelo, March, 1912 (Busck); Trinidad River, March, 1912 (Busck); Porto Bello, March, 1911, May, 1912 (Busck), and September, 1912 (G. F. Cleveland); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, May, 1912 (Busck).

### CHALCOËLOPSIS, new genus.

Palpi porrect, very short, hardly exceeding the front. Fore wing with veins 4–5 stalked, 7–10 stalked; hind wing with 4–5 stalked, a long cross-vein without veins, 6 from apex of cell, 7 anastomosing with 8. Male antennæ lengthily bipectinated, of female, serrate; spurs of hind tibiæ moderate, equal.

*Type of the genus.*—*Chalcoëlopsis pigrissima*, new species.

**CHALCOËLOPSIS PIGRISSIMA, new species.**

Fore wing dark brown, coarsely irrorate with black; an oblique blackish, slightly bronzy, band arises from middle of inner margin to cell; outer line double; its inner segment heavy, oblique from costa to vein 6 near margin, roundedly incurved to vein 2, inclosing an orange stain, oblique again below, slightly paler filled. Hind wing with a marginal row of metallic blue and violet spots in a black band, preceded by a little yellowish, the irrorations forming lines. Expanse, male, 14 mm.; female, 17 mm.

*Cotypes.*—Male and female, No. 16311, U.S.N.M.; Trinidad River, June, 1912 (Busck). Also 46 others, all females, with additional localities, La Chorrera, May, 1912 (Busck); Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, August, 1912 (C. P. Crafts).

This would seem to be a *Chalcoëla* or *Cataclysta* with aborted mouth parts. Specimens from the Guianas have been labeled by Mr. Schaus "*Cataclysta perlalis* Led.; *trilinealis* Walk." But I have been unable to trace these names. The species can not be a *Cataclysta* on account of the absence of the tongue.

**MACROTHECA PŒCILOSTIGMA, new species.**

Fore wing sordid luteous, powdered with dull crimson, which forms a streak on the costa at base and a large patch about tornus, rising nearly to the cell; a round black discal dot, large or minute. Hind wing pale fuscous. Expanse, 10 mm.

*Cotypes.*—Two males, No. 16314, U.S.N.M.; Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

### Subfamily CRAMBINÆ.

**CRAMBUS FISSIRADIELLUS Walker.**

206. Porto Bello, February, 1911 (Busck); Alhajuelo, April, 1911 (Busck); Paraiso, Canal Zone, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, May (Busck), July (J. Zetek), August and November, 1912 (C. P. Crafts); Taboga Island, June, 1911 (Busck).

**CRAMBUS TENUISTRIGATUS Zeller.**

3. Trinidad River, March, 1912 (Busck); Arajan, March, 1911 (Busck).

**CRAMBUS MERETRICELLA Schaus.**

4. Trinidad River, May, 1911, March and September, 1912 (Busck); La Chorrera, May, 1912 (Busck).

**CRAMBUS TACTELLUS, new species.**

Near Zeller's figure of *immuniellus* Zeller,[1] but the outer line is bent sharply at costa so that the triangular dark patch rests directly above the general course of the line and not beyond it; terminal line slender, not so heavy; wing pale lilacine gray, about evenly powdered; median powdery dark line curving around end of cell, oblique below, nearly complete. Hind wing soiled whitish in the male, fuscous in the female. Expanse, 11–12 mm.

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[1] Stett. Ent. Zeit., vol. 33, 1872, pl. 2, fig. 6.

*Cotypes.*—Three males, two females, No. 16325, U.S.N.M.; La Chorrera, May, 1912 (Busck); Cabima, May, 1911 (Busck); Paraiso, Canal Zone, April, 1911 (Busck).

**CRAMBUS RETUSELLUS Schaus.**

6. Cabima, May, 1911 (Busck); Trinidad River, September, 1912 (Busck).

Near Zeller's figure of *expansellus* Zeller,[1] but without the black moniliform line shown in that figure between the double outer line and termen. The specimens do not agree absolutely with Schaus's type of *retusellus*, but are so close that I do not like to separate them. Hind wing of male soiled whitish, of female, dark fuscous.

**CRAMBUS AGNESIELLA, new species.**

Silvery white; fore wing with extra-median fulvous line, bent at right angles above the middle; a subcostal fulvous dash from base to this line; outer line double, approaching outer margin below and ending near tornus, curved above; termen stained with fulvous; a terminal black line, forming spots in the interspaces from submedian to vein 4. Hind wing pale gray. Expanse, 9 mm.

*Type.*—No. 16327, U.S.N.M.: Trinidad River, March, 1912 (Busck).

**CRAMBUS INTANGENS, new species.**

White, with faint violaceous tint, coarsely irrorated with brown; a brown line along costa to beyond middle; median line oblique to cell, recurved next to costa, powdery, brown, with an inner duplication below cell; outer line double, its inner segment powdery and irregular, curving a little at costa, where the outer segment is slightly expanded; terminal line a trace only; fringe metallic gray. Hind wing faintly straw-color tinted, without markings, concolorous in the two sexes. Expanse, 9–11 mm.

*Cotypes.*—Three males, two females, No. 16326, U.S.N.M.; Porto Bello, March and April, 1911, and April, 1912 (Busck).

A specimen of this species from Costa Rica, in poor condition, is labeled *C. expansellus* Zeller by Mr. Schaus, but I do not think it can be that species.

**CULLADIA EUCOSMELLA, new species.**

Palpi white, a little touched with sordid ocher; front and vertex black-brown. Fore wing silvery white; a black-brown patch at base; a broad band before the middle and broad submarginal band, sending out a projection to the margin above the middle; a dark terminal line; fringe dark. Hind wing blackish, the fringe pale. Expanse, 12 mm.

*Type.*—Male, No. 16328, U.S.N.M.; Trinidad River, September, 1912 (Busck). Also six others with additional localities; Cabima, May, 1911 (Busck); Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, August, 1912 (C. P. Crafts).

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[1] Hor. Ent. Soc. Ross., vol. 13, 1877, pl. 1, fig. 18.

**PTOCHOSTOLA INCANELLUS Zeller.**

10. Tabogilla Island, February, 1912 (Busck); Corozal, Canal Zone April and May, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, May, 1911 and June, 1912 (Busck); Taboga Island, June, 1911 (Busck).

**PTOCHOSTOLA PYGMAEUS Zeller.**

129. Paraiso, Canal Zone, February, May, and June, 1911 (Busck); Corozal, Canal Zone, March and May, 1911, May, 1912 (Busck) and July, 1912 (J. Zetek); Trinidad River, March, 1912, May, 1911 and June, 1912 (Busck); Alhajuelo, April, 1911 (Busck); Porto Bello, February, March, April, and May, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck).

**ARGYRIA NIVALIS Drury.**

6. Corozal, Canal Zone, March, 1911 (Busck) and August, 1912 (C. P. Crafts); Cabima, May, 1911 (Busck).

The fringe is entirely dark leaden, not white-tipped as in the northern form. It may be named **fimbrialis**, new subspecies.

*Type.*—No. 16321, U.S.N.M.

**ARGYRIA TENELLA Zeller.**

1. Trinidad River, March, 1912 (Busck).

**ARGYRIA OPPOSITA Zeller.**

19. Porto Bello, April and May, 1912 (Busck); Cabima, May, 1911 (Busck); Corozal, Canal Zone, May (Busck), July (J. Zetek) and November, 1912 (C. P. Crafts); Trinidad River, June, 1912 (Busck).

**ARGYRIA PUSILLALIS Hübner.**

26. Porto Bello, February and March, 1911 (Busck); Trinidad River, March, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Corozal, Canal Zone, March, 1911 (Busck), July, August, and November, 1912 (C. P. Crafts).

All the specimens have the median band continuous across the wing. The varietal name **multifacta** is proposed.

*Type.*—No. 16316, U.S.N.M. (Porto Bello, February, 1911).

**ARGYRIA MOLYBDOPLECTA, new species.**

Dark gray, the inner area of fore wing broadly shaded with dull yellow nearly up to median vein. Hind wing whitish, shading to fuscous at margin. In the males the wing is more blunt at apex than in the females, the markings more distinct and contrasted. Lines slender, black, edged with white very narrowly; inner line crenulate, with inward angle at vein 1; outer line with a sinus below vein 2 which joins the large reniform, making it part of the sinus; a row of terminal dark dots. In the female the lines are slender and pulverulent, the sinus of outer line appears occluded. Expanse, 14–24 mm.

*Cotypes.*—Male and female, No. 16315, U.S.N.M.; Corozal, Canal Zone, July and November, 1912 (C. P. Crafts). Also 52 others with additional data, Cabima, May, 1911 (Busck); Corozal, Canal Zone, April and May, 1911 (Busck), and July, 1912 (J. Zetek); Porto Bello, February, 1911 (Busck); Trinidad River, May, 1911 (Busck).

**ARGYRIA ARGYRODIS, new species.**

Markings as in *A. croceivitella* Walker, but without any yellow along the inner margin of fore wing; silvery white; vertex of head and dorsal stripe on thorax golden yellow; fore wing with erect median band, costal stripe and subapical patch, with oblique spur yellow, stained with brown; termen and fringe of same color. Expanse, 14 mm.

*Type.*—Female, No. 16317, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also six others from the same place.

**ARGYRIA CENTRIFUGENS, new species.**

White; front white, vertex dark ocher; fore wing silvery white; a dark brown spot on costa and one on inner margin joined by a slender line; costal triangle divided by a white line; a dark terminal line, the fringe leaden brown. Hind wing white. Expanse, 14 mm.

*Type.*—No. 16318, U.S.N.M.; Paraiso, Canal Zone, February, 1911 (Busck). Also two others, Cabima, May, 1911 (Busck).

**ARGYRIA XANTHOGUMA, new species.**

Palpi white-tipped; front white; fore wing with median line slender, forming costal and marginal dots; costal triangle cut by a white line; terminal line narrow, the fringe dark leaden. Hind wing pale yellow tinted. Expanse, 14 mm.

*Type.*—Male, No. 16319, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also three others from the same place.

**UBIDA THYONELLA Schaus.**

*Platytes thy nella* Schaus, Ann. Mag. Nat. Hist. (8), vol. 11, 1913, p. 239.

1. Chiriqui, May, 1907 (W. Schaus).

The specimen is smaller than the type and in better condition. I think it is conspecific.

**UBIDA CRETACEIPARS, new species.**

Chalky white, the margin dull ocher; veins lined with dark brown, an oblique line from near middle of inner margin curving around cell to costa, with a broad shade from its loop to apex, cut by black veins; discal dot round, black; a terminal row of black dots. Hind wing white, unmarked. Expanse, 15 mm.

*Type.*—Female, No. 16329, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also another female from the same place.

**UBIDA MONODISA, new species.**

Chalky white, the veins narrowly dark brown, the interspaces largely filled with dull ocher rays, broadest in the cell and in a broad shade beyond; a white ray dividing the cell to the round black discal dot; costa on outer half with three faint oblique shades; terminal dots black, small. Hind wing white, veins and apex a little touched with sordid. Expanse, 23 mm.

*Type.*—No. 16330, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also another female from the same place.

**UBIDA NEOGYNÆCELLA, new species.**

Ground color white, veins and interspaces lined with creamy brown, a double border around cell, the discal ray double; an oblique costal line before apex bounds a narrow white subterminal line, at which all the linings end; termen creamy brown with a row of black terminal dots with white specks before them; fringe with brown interline. Hind wing whitish, becoming sordid outwardly and toward costa, defining a white subterminal line, beyond which are traces of black terminal dots in the gray termen, repeating imperfectly the marking of fore wing. Expanse, male, 18 mm.; female, 21 mm.

*Cotypes.*—Male and female, No. 16331, U.S.N.M.; Porto Bello, April and May, 1912 (Busck). Also five males, two females, with additional localities, Trinidad River, September, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck).

The tongue is present, but very weak, so I place the species in *Ubida* rather than in *Platytes* (*Argyria*). Male antennæ simple, flattened; female frenulum a single strong spine as in the male.

**DIATRÆA SACCHARALIS Fabricius, form TABERNELLA Dyar.**

69. Trinidad River, March and June, 1912 (Busck); Alhajuelo, April, 1911 (Busck); La Chorrera, May, 1912 (Busck), Porto Bello, May, 1911 (Busck); Corozal, Canal Zone, June (Busck); July and August, 1912 (C. P. Crafts).

**DIATRÆA LINEOLATA Walker.**

33. Cabima, May, 1911 (Busck); Porto Bello, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck); Corozal, Canal Zone, June, 1912 (Busck), July, 1912 (J. Zetek).

**DIATRÆA GAGA, new species.**

Fore wing straw-color, the veins lined in blackish, interlines brown; discal dot black, round, prominent; two outer lines subparallel, oblique, rounded off above; terminal dots compressed, subconfluent. Hind wing white. Expanse, 15–17 mm.

*Cotypes.*—Male and female, No. 16323, U.S.N.M.; Corozal, Canal Zone, June, 1912 (C. P. Crafts). Also 11 others with additional data, April, 1911 (Busck), July, 1912 (J. Zetek), and August, 1912 (C. P. Crafts).

**DIATRÆA SOLIPSA, new species.**

Wings narrower and more pointed at the apex than in *gaga;* markings similar, the vein-lines and interlines indistinct; discal dot small. Expanse, 12–15 mm.

*Cotypes.*—Male and female, No. 16324, U.S.N.M.; Porto Bello, February, 1911 (Busck); Trinidad River, May, 1911 (Busck). Also seven others, Corozal, Canal Zone, April, 1911, May and June, 1912 (Busck), November, 1912 (C. P. Crafts).

Very much like *gaga*, but whereas *gaga* looks like a minute *lineolata*, the present species resembles a minute *saccharalis*.

**IESTA CANCELLALIS, new species.**

Pale straw color, the two lines faint, powdery, approximate, slightly oblique; discal dot round, prominent; terminal dots distinct; a brown shade on costa at base and a patch at apex. Hind wing nearly white, unmarked. Expanse, 11 mm.

*Type.*—Male, No. 16322, U.S.N.M.; Corozal, Canal Zone, May, 1911 (Busck). Also 13 others with the same data except one, July, 1912 (J. Zetek); Paraiso, Canal Zone, January, 1911 (Busck).

**DORATOPERAS ATROSPARSELLUS Walker.**

5. Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck).

**ERUPA INCOLORALIS, new species.**

Fore wing pale lilacine straw-color with a few dark specks that form indistinctly a subterminal line. Hind wing pale straw-color. Expanse, 43 mm.

*Type.*—Female, No. 16320, U.S.N.M.; Trinidad River, March, 1912 (Busck).

Allied to *E. evanidella* Schaus.

### Subfamily SCOPARIINÆ.

**SCOPARIA PUSILLA, new species.**

Fore wing light gray powdered with black; inner line very oblique, straight, pale within, dark-powdered without; discal mark an agglomeration of dark scales in two opposed cusps; outer line with central outcurve, whitish, dark-powdered within; a row of terminal black dots. Hind wing sordid milky whitish, Expanse, 11 mm.

*Type.*—Female, No. 16334, U.S.N.M.; Cabima, May, 1911 (Busck). Also 11 males and 62 females that I take to be the same species (all in poor condition) with additional localities, Alhajuelo, April, 1911 (Busck); Trinidad River, June, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Corozal, Canal Zone, April, 1911 (Busck), August, 1912 (C. P. Crafts); Paraiso, Canal Zone, January, 1911 (Busck); La Chorrera, May, 1912 (Busck); Porto Bello, March, 1911, and February, 1912 (Busck); Taboga Island, June, 1911 (Busck).

### Subfamily PYRALINÆ.

**PYRALIS MANIHOTALIS Guenée.**

1. Paraiso, Canal Zone, January, 1911 (Busck).

**TEGULIFERA RESECTALIS Lederer.**

30. Alhajuelo, April, 1911 (Busck); Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, April, 1911 (Busck), August and

November, 1912 (C. P. Crafts); Taboga Island, February, 1912, and June, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, September, 1912 (Busck); Chiriquicito (W. Schaus).

Varies in color and distinctness of markings. I make *Pyralis nigrapuncta* Kaye to be the same species. Mr. Schaus separated Costa Rican specimens under the two names. His *nigrapuncta* consisted of two males, small and brightly marked as usual. His *resectalis*, a male and a female; the male, I take to be a species of *Herculia;* the female is large and dark, but fits well with the males marked *nigrapuncta*. The Costa Rican series runs strongly marked. The Panama one runs about like a series from Venezuela before me, that is rather contrastingly marked, more so than the Guiana series.

### Subfamily ENDOTRICHIINÆ.

### TABOGA, new genus.

Fore wing with veins 2 and 3 from before the angle of the cell, 4, 5 separate, 6 below the upper angle, 7–9 stalked, 8 and 9 coincident, 10 and 11 on the cell. Hind wing with vein 2 long before the angle of the cell, 3 before the angle, 4–5 stalked, 6 stalked with 7–8 which anastomose strongly. Labial palpi upturned nearly to vertex, smooth, terete; maxillary palpi very distinct, similar to the labial ones in shape and color, only smaller.

*Type of the genus.*—*Taboga inis*, new species.

**TABOGA INIS, new species.**

Fore wing dark gray, blackish powdered; lines whitish, the inner bent on submedian, else straight and followed by a little denser powdering; median line shown only below the cell, bent at right angles on submedian and vein 1; discal spot black, placed far out at the outer fourth of the wing on account of the very long cell; outer line far out, strongly and shortly excurved over end of cell; terminal line black, minutely broken. Hind wing impure whitish, the termen fuscous narrowly. Expanse, 13 mm.

*Type.*—Male, No. 16363, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also eight others, six from the same place and date, one Porto Bello, March, 1911 (Busck), and one, La Chorrera, April, 1912 (Busck).

### Subfamily EPIPASCHIINÆ.

**ARNATULA CIRCUMLUCENS, new species.**

Base of fore wing olive gray; a quadrate patch of the same color on the costa surrounded by white, which extends narrowly to the inner margin at the place of the inner line; wing olive gray beyond, shading to violacious toward tornus, lighter on the middle of the outer margin, where a series of black dashes are revealed. Hind wing fuscous with dark veins and a light line in the base of the fringe. Expanse, male, 13 mm.; female, 15 mm.

*Cotypes.*—Male and female, No. 16335, U.S.N.M.; Porto Bello, October, 1912 (G. F. Cleveland). Also four females from the same place with additional data, April and May (Busck) and December, 1912 (G. F. Cleveland).

Two males and two females are before me from French Guiana (W. Schaus).

**ARNATULA COLORATA, new species.**

Gray, stained with luteous before the inner and beyond the outer lines; basal space dark gray without bordering line; a black dot in cell; inner line at middle of wing, dark gray, bent outward below median vein; outer line similar, excurved above middle and slightly denticulate; a whitish mark on costa beyond it, forming a faint border below; terminal dots black. Hind wing soiled whitish, fuscous at apex. Expanse, 16 mm.

*Type.*—Female, No. 16336, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**ARNATULA SUBFLAVIDA, new species.**

Fore wing olive gray; a white ray through the middle from base, nearly touching the outer line; a similar white line on the inner margin; outer line curved, white, parallel to and near the outer margin; a darker spot at end of cell and at base of inner margin. Hind wing orange-yellow with narrow gray border. Expanse, 17 mm.

*Type.*—Male, No. 16337, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also one male, Cabima, May, 1911 (Busck).

**TIOGA FOVEALIS Hampson.**

1. Corozal, Canal Zone, June, 1912 (Busck).

**TIOGA TERSILLA, new species.**

Small; grayish white; fore wing with black at the base; inner line white, curved to vein 1, then straight, with black shades on both sides; median space with a brown shade and black irrorations outwardly; outer line white, denticulate, outbent in a blunt point a little above the middle, edged within by a black dotted line; terminal space clouded with brownish below, with black at apex; a terminal row of black dots. Hind wing whitish, with fuscous veins and margin. Expanse, 10 mm.

*Type.*—Male, No. 16342, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**POCOCERA ATRAMENTALIS Lederer.**

25. Paraiso, Canal Zone, January and February, 1911 (Busck); Porto Bello, February and March, 1911, April and May, 1912 (Busck); La Chorrera, April and May, 1912 (Busck); Corozal, Canal Zone, April and May, 1912 (Busck).

**POCOCERA BASIGERA, new species.**

Fore wing with the basal space broad, black; inner line pale, straight, upright bounded outwardly by a fine dark line; rest of the wing sordid yellowish, clouded with brownish over tornus and black at apex; outer line vague, pale, denticulate, exserted above middle; terminal dots nearly confluent. Hind wing fuscous-black, pale at base. Fringes pale on both wings. Expanse, 16 mm.

*Type.*—Female, No. 16338, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**POCOCERA ADOLESCENS, new species.**

Fore wing greenish gray, the costa dark centrally; a blackish triangular mark at base of inner margin, origin of vein 2 and round arc in cell; inner line oblique, of the pale ground, slightly irregular; outer line whitish, dentate, excurved above, relieved in the dark outer ground, which shades to violaceous gray at apex. Hind wing dark fuscous. Palpi of male very long, recurved over the thorax, concealing a hair-pencil; no process on antenna.

*Cotypes.*—Male and female, No. 16339, U.S.N.M.; Porto Bello, May, 1912 (Busck).

**POCOCERA CAPNODON, new species.**

Dark gray, irrorate, the lines of lighter ground color; fore wing blackish at base on inner margin; outer line bent outward on submedian, broad, edged by dark narrow lines, not waved; a luteous gray patch bounded by vein 2, segment of the obsolete median line, outer line and inner margin; discal venules dark-lined in the male; outer line pale, slightly excurved in the upper portion, edged by dotted denticulate dark lines; terminal space shaded with blackish; terminal black line of nearly joined dots. Hind wing dark fuscous, lighter between the veins in the male. Expanse, 14 mm.

*Cotypes.*—Two males, one female, No. 16340, U.S.N.M.; Porto Bello, April, 1912 (Busck); Trinidad River, March, 1912 (Busck).

**POCOCERA SPHÆROPHORA, new species.**

Wings long and narrow; fore wing fuscous shaded over luteous, which appears mesially; base dark to the inner line, which is black, of three arcs, each inclosing a black tufted spot, of which the center one is large; a black waved shade beyond the middle; outer line close to the margin, black within, pale without, denticulate, oblique above; terminal space dark. Hind wing blackish fuscous, subtranslucent between the veins. Expanse, 26 mm.

*Type.*—Female, No. 16341, U.S.N.M.; Tabernilla, Canal Zone, May, 1907 (Busck).

**MACALLA THYRSISALIS Walker.**

2. Porto Bello, March, 1911 (Busck).

**MACALLA NIVEORUFA Hampson.**

5. Corozal, Canal Zone, April, 1911 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June and September, 1912 (Busck).

**LEPIDOGMA VIOLESCENS, new species.**

Violaceous gray with sparse black irrorations; a black mark at base of inner margin; inner line near the middle of the wing, slightly curved, pale with dark inner edge; outer line distinct, narrow, white with black powdering on the inner edge, broadly excurved above; a black curved shade at apex. Hind wing fuscous, blackish outwardly; a paler line in base of fringe. Expanse, 16 mm.

*Type.*—Female, No. 16343, U.S.N.M.; Tabernilla, Canal Zone, May, 1907 (Busck).

**STERICTA SCOPIPES Felder.**

2. Trinidad River, March, 1912 (Busck); Cabima, May, 1911 (Busck).

**JOCARA SUBCURVALIS Schaus.**

1. Porto Bello, May, 1912 (Busck).

**CHLOROPASCHIA CANITIES Schaus.**

1. Cabima, May, 1911 (Busck).

## GENOPASCHIA, new genus.

Palpi porrect, short, downcurved and hairy below in the male, exceeding the front, twice as long as the head, smooth, the second joint somewhat thickened with scales above. Fore wing with veins 2, 3 before the end of the cell, 4–5 stalked, 6 from apex to cell, 7–10 stalked, 11 on the cell. Hind wing with vein 2 long before the end of the cell, 3 shortly stalked with 4–5 (3 from the end of the cell in the female), 6 from the apex of the cell, 7 anastomosing with 8.

*Type of the genus.*—*Genopaschia protomis*, new species.

**GENOPASCHIA PROTOMIS, new species.**

Fore wing gray, shaded with blackish; inner line white, straight; inwardly oblique, followed by a round black dot in the end of the cell; outer line white, near the margin, excurved above the middle; outer half of median space and terminal space darkly shaded. Hind wing soiled whitish in the male, fuscous in the female. Expanse, male, 11 mm.; female, 14 mm.

*Cotypes.*—Male and female, No. 16348, U.S.N.M.; male, Porto Bello, February, 1912 (Busck); female, Trinidad River, March, 1912 (Busck).

## POCOPASCHIA, new genus.

Palpi short, in the male upturned to the middle of the front, the third joint clawlike, in the female porrect, shortly exceeding the front. Fore wing with vein 2 near the middle of the cell, 3 before the end, 4–5 shortly stalked, 6 from the apex of the cell, 7–10 stalked, 11 on the cell. Hind wing with 2, 3 from the cell, 4–5 long-stalked, 6 from the apex of cell, 7 anastomosing with 8.

*Type of the genus.*—*Jocara noctuina* Schaus.[1]

$a^1$. *Fore wing with vein 7 arising beyond vein 9.*
    $b^1$. *Hind wing with vein 3 from end of cell.*

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[1] Ann. Mag. Nat. Hist. (8), vol. 9, 1912, p. 663.

**POCOPASCHIA NOCTUINA Schaus.**

8. Cabima, May, 1911 (Busck); Trinidad River, March and June, 1912 (Busck).

*$b^2$. Hind wing with vein 3 stalked with 4 and 5.*

**POCOPASCHIA BELLANGULA, new species.**

Fore wing purple-brown, shading to gray on outer fourth; base deep purple-brown, bounded by a white line that runs obliquely from costa to vein 1 and is there bent at right angles; median space reddish purple, shading outward to gray; outer line very near the margin, white, denticulate, retreating at apex, which is blackish purple. Hind wing blackish fuscous. Expanse, 17 mm.

*Type.*—Male, No. 16344, U.S.N.M.; Trinidad River, March, 1912 (Busck).

*$a^2$. Fore wing with vein 7 arising before vein 9.*

**POCOPASCHIA ACCELERANS, new species.**

Fore wing densely black-irrorate over pale ocher tinted ground; basal area velvety black, bounded by a narrow curved whitish inner line; a small rounded discal dot; outer line pale, incurved at subcosta and submedian, outcurved close to margin between; a round black patch in the incurve below apex; a terminal broken black line. Hind wing ocher tinted, with narrow terminal fuscous shade-line. Expanse, 24–26 mm.

*Cotypes.*—Two males, No. 16345, U.S.N.M.; Trinidad River, March, 1912.

## STENOPASCHIA, new genus.

Palpi porrect, short, curved in the male, exceeding the front, twice as long as the head in the female and hairy below. Maxillary palpi with a triangular tuft of scales. Fore wing with veins 2 and 3 from the cell, 4 and 5 separate, 6 below apex of cell, 7–9 stalked, 8 absent, 10 and 11 on the cell, free. Hind wing with vein 2 from the cell, 3 and 5 separate, 4 absent, 6 from apex of cell, 7 anastomosing with 8.

*Type of the genus.—Stenopaschia trichopteris,* new species.

**STENOPASCHIA TRICHOPTERIS, new species.**

Fore wing olive green (faded to ocher); a black band along the basal half of the costa, joining a tufted black spot in the cell; a patch below in submedian space, further out in the male than in the female; a small dot at the end of the cell; outer line of black scales, excurved above, more or less broken and containing a few silvery scales. Hind wing fuscous, dark in the female, lighter between the veins in the male. Expanse, male, 15 mm.; female, 19 mm.

*Cotypes.*—Male and two females, No. 16346, U.S.N.M.; Taboga Island, June, 1911, male (Busck); Trinidad River, June, 1912, females (Busck).

## GLOSSOPASCHIA, new genus.

Labial palpi smooth, upturned, the second joint reaching vertex, the third slender, long. Maxillary palpi small, scaly. Tongue projecting about twice the length of the head, downcurved, completely scaled, the scales forming a long fringe beneath. Fore wing with vein 2 from the cell, 3 from the end, 4–5 stalked, 6 from the apex of cell, 7–9 stalked, 10 and 11 on the cell, free. Hind wing with vein 2 from the cell, 3 and 5 from its end, 4 absent, 6 from the apex of cell, 7 anastomosing with 8.

*Type of the genus.*—*Glossopaschia cænoses*, new species.

**GLOSSOPASCHIA CÆNOSES, new species.**

Fore wing narrow, light gray with scattered black irrorations; a black tufted spot below the middle of the cell; a little dot at end; outer line near the margin, dotted, black, slightly outcurved; termen dark-shaded; terminal dots black. Hind wing soiled white with fuscous veins and margin. Expanse, 15–19 mm.

*Cotypes.*—Two females, No. 16347, U.S.N.M.; La Chorrera, May, 1912 (Busck); Cabima, May, 1911 (Busck).

### Subfamily PHYCITINÆ.

**MYELOIS TRANSITELLA Walker.**

24. Trinidad River, March and June, 1912 (Busck); Alajuelo, April, 1911 (Busck); Panama City, April, 1911 (Busck); Cabima, May, 1911 (Busck); Taboga Island, June, 1911 (Busck); Porto Bello, April (Busck) and December, 1912 (G. F. Cleveland).

The larva feeds in the dry cacao pods. None of the specimens agree with Ragonot's definition in having vein 8 of hind wing free. Guiana specimens are the same, and of three before me from Grenada, British West Indies, only one agrees with Ragonot's character, the two having veins 7 and 8 anastomosing nearly to apex. I have no specimens from Haiti, the type locality, but believe the character to be valueless, as the specimens all agree otherwise.

**MYELOIS DECOLOR Zeller.**

2. Porto Bello, April (Busck) and December, 1912 (G. F. Cleveland).

**MYELOIS POMBRA, new species.**

Pale gray, the veins and discal cross-vein lined in pale fuscous; lines whitish, rather broad but not contrasted, the inner one far out and straight across the wing, the outer one bent on the stalk of veins 4–5; no terminal dots; fringe pale. Hind wing translucent pale gray, paler at base. Expanse, 17 mm.

*Type.*—Male, No. 16365, U.S.N.M.; Cabima, May, 1911 (Busck).

**MYELOIS EUZOPHERELLA, new species.**

Fore wing with veins 4–5 stalked, 10 stalked; hind wing with 3–5 stalked; gray, a little mixed with reddish; lines distinct, pale, with dark edges, far out, parallel and nearly straight; a circle of black blotches about the discal spot; veins with broken black streaks, terminal dots present, small. Hind wing subtranslucent, pale fuscous, the veins, costa, and margin darker. Expanse, male, 18 mm.; female, 22 mm.

*Cotypes.*—Male and female, No. 16367, U.S.N.M.; Cabima, May, 1911 (Busck); Trinidad River, June, 1912 (Busck). Also nine others with additional localities, Corozal, Canal Zone, May, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

**FUNDELLA PELLUCENS Zeller.**

2. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

### DIFUNDELLA, new genus.

Fore wing with veins 2–3 curved, parallel, rather near the end of the cell, 4–5 approximate at base, 6 below apex of cell, curved at base, 8–9 stalked, 10 and 11 on the cell. Hind wing with 2 rather near the end of the cell, 3 approximated to the stalk of 4–5, which is very long, 6 from the apex of the cell, 7 anastomosing with 8. Labial palpi upturned to vertex; smooth; maxillary palpi stout-filiform. Male antennæ simple, not curved at base, not ciliate.

*Type of the genus.*—*Difundella corynophora*, new species.

**DIFUNDELLA CORYNOPHORA, new species.**

Fore wing dull black in the basal space and upper half of median space, with short black rays on the discal venules; rest of wing brown with red irrorations; inner line oblique, straight, red-centered; discal mark reniform, reddish, pale; outer line red-centered, irregular and a little excurved over discal venules, followed by blackish above; termen slightly purplish. Hind wing blackish, translucent, in the male beneath with a brown tuft on discal vein in cell and a large one on submedian below it; inner margin grooved and hairy. Expanse, 15 mm.

*Type.*—Male, No. 16377, U.S.N.M.; La Chorrera, May, 1912 (Busck).

### ANYPSIPYLA, new genus.

Fore wing with veins 2, 3 close to angle of cell, 4–5 long-stalked, 6 below angle of cell, straight, 8–9 stalked, 10 and 11 on the cell. Hind wing with vein 2 before the angle of the cell, 3–5 stalked, all the veins firmly united, 6 from apex of cell, 7–8 long-anastomosing. Labial palpi upturned above vertex; maxillary palpi filiform, slightly dilated with scales; antennæ of male simple, ciliate.

*Type of the genus.*—*Anypsipyla univitella*, new species.

**ANYPSIPYLA UNIVITELLA, new species.**

Fore wing dark gray; a broad white band through the cell, touching the costa for a space beyond the base and at its termination; base rather broadly dark gray; two small black dots and a dash at the end of the cell; terminal dots black, nearly confluent; a narrow black line along submedian fold. Hind wing whitish, translucent, the veins and termen dark. Expanse, 22 mm.

*Type.*—Female, No. 16368, U.S.N.M.; Corozal, Canal Zone, November, 1912 (C. P. Crafts). Also one male and two females with additional data, April, 1912 (Busck) and additional locality, Porto Bello, May, 1912 (Busck).

## DRESCOMA, new genus.

Fore wing with veins 2, 3 before angle of cell, 4, 5 separate, 6 below upper angle of cell, 8–9 stalked, 10, 11 on the cell. Hind wing with 2 before the angle, median vein bifid, 4–5 stalked, cell short the cross-vein not opposite 3, 6 at apex of cell, 7 and 8 separate, parallel. Labial palpi upturned to vertex; maxillary palpi thickly filiform, bent inward; male antennæ simple, very slightly thickened at base. Hind wing with modifications beneath in the male; tip of abdomen with dense black tufts.

*Type of the genus.*—*Drescoma cyrdipsa*, new species.

**DRESCOMA SORAELLA Druce.**

*Homœosoma soraella* Druce, Biol. Cent.-Amer., Lep. Het., vol. 2, 1899, p. 565.

5. Trinidad River, March, 1912 (Busck); Corozal, Canal Zone, May, 1912 (Busck) and November, 1912 (C. P. Crafts); Porto Bello, October, 1912 (G. F. Cleveland).

Druce's characterization is insufficient to distinguish between the three species before me, consequently I adopt Schaus's identification of *soraella* in Costa Rican specimens, the male with a raised shining black disk in the cell of hind wing below, adjoined by a hair tuft. The specimens have very dark hind wings and do not agree well with Druce's figure (Plate 101, fig. 28), which comes nearer to *cinilixa*. I therefore suggest the alternative name **drucella** for this form.

*Type.*—Male, No. 16373, U.S.N.M.; Porto Bello, October, 1912 (G. F. Cleveland).

**DRESCOMA CYRDIPSA, new species.**

Markings as in *D. drucella* Dyar and *Megarthria peterseni* Zeller, rather larger than the former, smaller than the latter; distinguished only by the male secondary character, an impressed pale fovea on costa of hind wing below, bending the veins into the cell, and followed basally by a notched area of black scales. Expanse, 16 mm.

*Type.*—Male, No. 16374, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also five males and eight females, the latter presumably of this species, with additional localities, Trinidad River, March and June, 1912 (Busck); Porto Bello, May (Busck) and October, 1912 (G. F. Cleveland); Cabima, May, 1911 (Busck); Corozal, Canal Zone, February, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

**DRESCOMA CINILIXA, new species.**

Markings essentially as in the preceding; fore wing narrower, the outer line further out and more excurved below; dark bar crossing the white costal space slender and indistinct. Hind wing whitish, fuscous only on margin and costa. Expanse, 16 mm. Male with small oblique black mark on costa below, the costa slightly indented; streaks of rusty scales along subcosta and vein 7 well toward apex and a short one on discal fold in the cell; a row of black scales along the base of inner margin.

*Type.*—Male, No. 16375, U.S.N.M.; La Chorrera, May, 1912 (Busck).

## ZAMAGIRIA, new genus.

Fore wing with veins 2, 3 before the angle of the cell, 4–5 closely approximated on basal third, 6 from the apex of the cell, 8–9 long stalked, 10 and 11 on the cell. Hind wing with vein 2 before the angle of the cell, 3 from the angle, 4–5 stalked for over half their length; median nervure bifid (in Ragonot's sense), cell short, the cross-vein not opposite vein 3. Maxillary palpi of the male with two long tufts, furcate on a slender stem. Labial palpi upturned above vertex, thick, hollowed, the third joint short, acicular. Antennæ pubescent; a hollow at base filled with scales.

*Type of the genus.*—*Zamagiria dixolophella*, new species.

**ZAMAGIRIA DIXOLOPHELLA, new species.**

Dark gray, the lines indistinct; basal space lighter gray below the costa, lightest next the inner line; a broad salmon reddish area, except on costa, edged by a line of black scales within, by a whitish line without, which is dentate on vein 1; outer line a pale shade close to the margin, bordered by black marks on the veins within. Hind wing translucent pale fuscous, the veins and termen darker. Expanse, 21 mm. The two long tufts on the maxillary palpi are dark pink and reach back on the fore wing in the specimen.

*Type.*—Male, No. 16376, U.S.N.M.; Corozal, Canal Zone, November, 1912 (C. P. Crafts).

## CABIMA, new genus.

Fore wing with veins 2, 3 before the end of the cell, 4–5 closely approximated to their basal thirds or stalked, 6 below apex of cell, 8–9 stalked, 10 and 11 from the cell, 10 running close to the stalk of 8–9. Hind wing with the cell long, vein 2 near the middle, 3 from the lower angle, joining the cross-vein narrowly, 4–5 long-stalked, 6 from apex of cell, 7 anastomosing with 8 nearly to apex. Labial palpi slender, oblique, straight, the third joint long and distinct; maxillary palpi small, filiform. Antennæ of male ciliate, a deep sinus at base of flagellum with a small tooth of scales, not filling the sinus, but making it into a notch.

*Type of the genus.*—*Cabima dosia*, new species.

Near *Hypsipyla* Ragonot, but differing in the palpi and male antennæ.

**CABIMA DOSIA, new species.**

Light gray, shading to red-brown on the inner half of wing; veins with many black streaks; inner line a vague cloud; outer line of dots on the veins, followed by whitish, angled at the veins 4–5; terminal dots black. Hind wing soiled white in the male, shaded with fuscous on costa and margin in the female, translucent. Expanse, male, 25 mm.; female, 31 mm.

*Cotypes.*—Male and female, No. 16369, U.S.N.M.; Cabima, May, 1911 (Busck). Also seven others from the same place.

**CABIMA DECURRENS, new species.**

Luteous gray, the veins streaked with black, forming nearly a band from vein 1 to inner margin, close streaked costally; the streaks are cut across the discal venules for the outer line. Hind wing pellucid white, gray on costa and termen; fringe pale gray. Expanse, 24 mm.

*Type.*—Male, No. 16370, U.S.N.M.; Trinidad River, March, 1912. (Busck). Also one male from the same place, three females from La Chorrera, May, 1912 (Busck), and one from Corozal, Canal Zone, March, 1912 (Busck).

The notch in the antennæ is smaller than in *dosia* and involving fewer joints.

**CABIMA HOPLIDICE, new species.**

Dark gray with traces of purplish veins, the costa streaked with black; a small discal mark; outer line indicated by a row of dots. Hind wing semitranslucent smoky blackish, darker on the costa. Expanse, 26 mm.

*Type.*—Male, No. 16371, U.S.N.M.; Porto Bello, April, 1912 (Busck).

**HYPSIPYLA MURISCIS, new species.**

Fore wing white on costal half, shading to purplish gray on the inner half; a blackish spot near base of costa and another on inner margin; inner line blackish, bent at an angle on median vein, its termination opposite its inception; two black discal dots; discal venules streaked with black; outer line double and black on upper third, whitish and without borders below, bent out a little at veins 4–5; a row of terminal black dots. Hind wing whitish, translucent, the costa and termen gray. Expanse, 24 mm.

*Type.*—Male, No. 16367, U.S.N.M.; Cabima, May, 1911 (Busck).

## CHORRERA, new genus.

Fore wing with veins 2 to 5 separate, 6 below end of cell, 8–9 stalked, 10 and 11 on the cell. Hind wing with 2 before the end of the cell, 3 closely approximated to 4–5 at base, 4–5 stalked; cell rather long, reaching to the middle of the wing; 6 from the apex of the cell, 8 close to 7 for a long distance, not anastomosing. Palpi slender, upturned. Antennæ of male with a small but rather long tuft of scales in a shallow sinus at base.

*Type of the genus.*—*Chorrera idiotes,* new species.

**CHORRERA IDIOTES, new species.**

Dark gray with slightly luteous underground, irrorated with black, somewhat transversely; general effect dark; lines inconspicuous, the inner far from the base, pale, with black outer edge, a little oblique, denatate in the cell and on submedian; outer line near the margin, its inner black edge only distinct, indented subcostally, followed by black; a black terminal line. Hind wing pure white, translucent; costa narrowly dark fuscous. Expanse, male, 14 mm.; female, 17 mm.

*Cotypes.*—Male and female, No. 16378, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also 11 others from the same place.

**ORCYTOMETOPIA FOSSULATELLA Ragonot.**

5. Corozal, Canal Zone, April, 1912 (Busck); Cabima, May, 1911 (Busck); La Choreira, May, 1912 (Busck); Porto Bello, October, 1912 (G. F. Cleveland).

**ORYCTOMETOPIA CLEVELANDELLA, new species.**

Fore wing rosy gray on the inner half, the costa broadly white; base dark; inner line oblique, broken into dots, dull crimson across the white, gray below; discal dot double, dull crimson; outer line near the margin, nearly straight, whitish, edged with dull crimson within across the white, gray below; termen tinged with crimson; a dark shaded terminal line. Hind wing translucent whitish in the male, darker in the female, the veins strongly dark-lined and the folds slightly lined; a double dark fuscous terminal line; fringe dark. Expanse, male, 16 mm.; female, 17 mm.

*Cotypes.*—Male and female, No. 16372, U.S.N.M.; Porto Bello, December, 1912 (G. F. Cleveland). Also two dwarfed females, Tabogilla Island, February, 1912, marked "leaf-roller on tree at seashore." (Busck).

**ACROBASIS CRASSISQUAMELLA Hampson.**

3. Porto Bello, April, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

**ACROBASIS (?) JOCARELLA Schaus.**

1. Porto Bello, December, 1912 (G. F. Cleveland).

I do not think this species belongs to *Acrobasis*, but as the specimen is a female it can not be positively placed.

**DASYPYGA QUERNA, new species.**

Fore wing gray; basal space faintly tinged with reddish; inner line straight, oblique, composed of a row of black dots; discal dot powdery, followed by a cloud below; outer line of black dots in faint whitish, bent at vein 5 and a little incurved above; costal region powdered with black; terminal black dots distinct. Hind wing pale, translucent; veins, costa, terminal line and a line in fringe fuscous. Expanse, 11 mm.

*Type.*—Male, No. 16384, U.S.N.M.; La Chorrera, May, 1912 (Busck).

## HOMALOPALPIA, new genus.

As in *Picsmopoda* Zeller, but the labial palpi of the male flattened and thickened with scales; male antennæ with the basal joint modified by a central notch or pocket, the shaft simple or with a row of flattened teeth on the upper side.

**HOMALOPALPIA DALERA, new species.**

Basal joint of antennæ of male with a round pocket containing a black prominence, the shaft thickened at base by a row of black teeth on the upper side. Vertex with a high tuft of scales. Fore wing with the basal space black-brown, with large, somewhat raised scales; rest of wing light tan-gray, the marks indistinct; a broad brownish shading across cell; narrow conjoined discal dots and dotted border to the pale outer line; terminal dots joined by a fine line; fringe pale rosy. Hind wing translucent soiled whitish, with terminal fuscous line; fringe dark at base. Expanse, 15 mm.

*Type.*—Male, No. 16379, U.S.N.M.; La Chorrera, April, 1912 (Busck). Also one from Porto Bello, March, 1911 (Busck).

A fine series from Costa Rica has been identified by Mr. Schaus as *Piesmopoda columnella* Zeller, but we have another similar species with different male antennæ, so named by Sir G. F. Hampson and they can not both be Zeller's species. Zeller described from a female from Colombia and his species is unrecognizable except by further collections from the same locality.

**PIESMOPODA LAIDION Zeller.**

1. Porto Bello, February, 1911 (Busck).

**PIESMOPODA XANTHOPOLYS, new species.**

Fore wing bright yellow, a little olive tinted, shading to purple and white along costa and beyond the middle, finally deep purple with white irrorations; only slight traces of the outer line. Hind wing faintly fuscous stained, especially on the margin. Expanse, 13 mm.

*Type.*—Female, No. 16380, U.S.N.M.; Porto Bello, September, 1912 (G. F. Cleveland). Also three others with additional data, December, 1912 (G. F. Cleveland), and additional localities, La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, July, 1912 (J. Zetek).

Near *P. flavicans* Zeller, but the yellow more restricted, the outer line obsolete.

**PIESMOPODA XANTHOMERA, new species.**

Fore wing with a small area of olive yellow near the base; base and wing beyond purple, washed with white over the costal area; discal dots dark, double; outer line far out, whitish, straight. Hind wing blackish fuscous, the disk between the veins semitransparent. Expanse, 15 mm.

*Type.*—Female, No. 16381, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also two males and four females with additional localities, Porto Bello, September and October, 1912 (G. F. Cleveland); Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck).

Varies in size, the males 10 mm., the females 11–16 mm. A male from French Guiana is labeled by Sir G. F. Hampson "*Piesmopoda flavicans* Zeller. The Guatemala sp. on which *Discopalpia* is founded is quite distinct." *Discopalpia* Ragonot[1] was supposed to have been founded on *Myelois flavicans* Zeller, but according to the above note, Ragonot's specimen was misidentified. *Flavicans* falls in *Piesmopoda*, and *Discopalpia*, with this type, therefore becomes a synonym of *Piesmopoda*, its diagnosis being in error, taken from a different, unnamed species.

**PIESMOPODA XANTHOUDEMIA, new species.**

The whole of fore wing violaceous-olive, no separate yellow area, the colors entirely blended; costal half thickly white-powdered; costal edge dark red; inner line a trace, dark; outer line far out, whitish, nearly straight. Hind wing whitish with fuscous veins and margin. Expanse, 16 mm.

*Type.*—Male, No. 16382, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also one male and one female with additional locality, Paraiso, Canal Zone, January, 1911 (Busck).

**PHYCITA ALMONELLA, new species.**

Fore wing dark gray, rosy tinged, broadly powdered with white along costa to outer line; inner line obscure, outer one far out, straight, whitish; discal dots minute but distinct, dark, separate. Hind wing translucent, fuscous tinged. Expanse, 15 mm.

Male with a pale hair tuft on the claspers; hind wing with rusty brown scales along base of costa and bases of veins beneath; antennæ with a broad flattened area at base, probably bearing a tuft in fresh condition; fore wing with vein 10 running close to 8–9, 4 and 5 approximated closely for a short distance at base.

*Type.*—Male, No. 16383, U.S.N.M.; Porto Bello, May, 1912 (Busck). Also two females, presumably the same species, La Chorrera, May, 1912 (Busck).

**ELASMOPALPUS LIGNOSELLUS Zeller.**

58. Trinidad River, March, 1912 (Busck); Porto Bello, April, May (Busck) and October, 1912 (G. F. Cleveland); Alhajuelo, April, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); Paraiso, Canal Zone, May, 1911 (Busck); La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, May, 1912 (Busck), and July, 1912 (C. P. Crafts.)

**ELASMOPALPUS RUBEDINELLUS Zeller.**

67. Taboga Island, February, 1912 (Busck); Trinidad River, March, 1912 (Busck); Porto Bello, April, May (Busck) and October, 1912

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[1] Romanoff, Mém. sur les Lep., vol. 7, 1893, p. 167.

(G. F. Cleveland); Alhajuelo, April, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck); La Chorrera, April and May, 1912 (Busck); Corozal, Canal Zone, April and May, 1911 (Busck), July (J. Zetek, C. P. Crafts) and August, 1912 (C. P. Crafts).

**ANCYLOSTOMIA STERCOREA Zeller.**

3. Trinidad River, March, 1912 (Busck); La Chorrera, May, 1912 (Busck).

## ILLATILA, new genus.

Fore wing with vein 2 before the angle of the cell, 3 at the angle, 4–5 stalked, not forming a straight line with the median, 6 below apex of cell, 8–9 stalked, 10 and 11 on the cell, 10 close to the end. Hind wing with the cell short, vein 2 at the angle, 4 absent, 3 and 5 long stalked, 6 at the apex of cell, 7 and 8 anastomosing for half the distance beyond the cell. Labial palpi upturned to vertex, terete, cylindrical; maxillary palpi scaly, filiform. Male antennæ simple.

*Type of the genus.—Illatila gurbyris*, new species.

**ILLATILA GURBYRIS, new species.**

Fore wing brownish gray, shaded with black at base and over cell beyond inner line and discal spot, the latter pale with club-like rays on the discal venules; lines black, slender; inner line beyond the black basal space, bent a little on the median vein; outer line far out, its median segment a little excerted, not dentate, followed by a pale line; terminal dots subconfluent. Hind wing soiled whitish, a little ocherous on the fringe; costa narrowly grayish. Expanse, 13 mm.

*Type.*—Male, No. 16385, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also two males, one female with the same data.

**EUZOPHERA TINTILLA, new species.**

Fore wing narrow, pale gray, a trace of reddish on the inner half, which accumulates into a rounded patch on vein 1 at middle of median space; lines distinct, slender, black, the inner one strongly rounded outwardly and irregularly crenulate, the outer parallel to the margin, denticulate on the median venules, but hardly excurved; discal dots joined; terminal dots subconfluent. Hind wing whitish, translucent, the veins terminally and double line fuscous. Expanse 19 mm.

*Type.*—Male, No. 16386, U.S.N.M.; Porto Bello, April, 1912 (Busck).

**EUZOPHERA MABES, new species.**

Fore wing broad, purplish brown, perhaps green when fresh; inner line blackish, bent at right angles in the middle; discal dots imperfectly separated; outer line parallel to the margin, subcrenulate and very slightly exserted over the discal venules, blackish, followed by a pale shade and a second blackish line at costa only; terminal dots subconfluent. Hind wing blackish, subtranslucent between the veins, the fringe with a pale basal line. Expanse, 15 mm.

*Type*.—Female, No. 16387, U.S.N.M.; Taboga Island, February, 1912. Also another female, less distinctly marked, Porto Bello, April, 1912 (Busck).

**EUZOPHERA CONQUISTADOR, new species.**

Purplish brown, dark through the median space and narrowly at base; inner line a broad light area, angled outwardly on submedian fold and incurved on vein 1; discal mark light; outer line broad, pale, denticulate on its inner border. Hind wing fuscous blackish. Expanse, 18 mm.

*Type*.—Female, No. 16390, U.S.N.M.; Cabima, May, 1911 (Busck).

**EUZOPHERA RINMEA, new species.**

Gray, dusted with brown black; inner line white, oblique, distinct, crumpled in the middle, followed by a black shade that diffuses outwardly; discal dots black, separate, followed by a row of streaks on the venules; outer line whitish, incurved subcostally and outward below, preceded by dots on the veins; terminal dots black. Hind wing pale fuscous with dark veins and termen. Expanse, 15 mm.

*Type*.—Female, No. 16391, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**EUZOPHERA GLOMIS, new species.**

Violaceous gray, perhaps faded from a richer color; base blackish; inner line black, oblique, broad on costa, narrowing below, angled outwardly in submedian fold; discal dots separated; outer line very near the margin, gently excurved, angled at submedian fold, blackish, slender, subdenticulate, followed by a pale border more distinct than the line; terminal dots small. Hind wing blackish; a pale line at base of the fringe. Expanse, 15 mm.

*Type*.—Female, No. 16388, U.S.N.M.; Taboga Island, February, 1912 (Busck).

**EUZOPHERA CLIMOSA, new species.**

Fore wing broad and more trigonate than usual; purplish gray; costa broadly white shaded, narrowly dark at the edge; inner line obsolete; discal dot sometimes absent; outer line a pale diffuse shade, preceded by blackish and followed by the same near costa also; terminal dots nearly obsolete. Hind wing dark fuscous in the male, black in the female. Expanse, male, 12 mm.; female, 15 mm.

*Cotypes*.—Male and female, No. 16389, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also four females with additional locality, Taboga Island, February, 1912 (Busck).

## ANTHOPTERYX, new genus.

Fore wing with vein 2 from long before the angle of the cell, 3 and 5 from the angle, 4 absent, 6 above the middle of the cross vein, 8–9 stalked, 10 close to the apex of the cell, 11 on the cell. Hind wing with the cell long, over half the length of the wing, vein 2 from before the angle, 3 and 5 stalked, 4 absent, 6 from the apex of the cell, 7 and 8 anastomosing nearly to the tip. Labial palpi slender, obliquely upturned to the vertex. Antennæ of female ciliate.

*Type of the genus.*—*Anthopteryx irichampa*, new species.

**ANTHOPTERYX IRICHAMPA**, new species.

Gray, shaded with reddish brown except along costa; basal space wide with narrow longitudinal black lines in the center; inner line slender, regularly and distinctly arcuate, blackish, preceded by pale; discal dots strongly fused into a black bar; discal venules lined in black, at bases of veins 2, 3, and 4, forming short bars; outer line near the margin, nearly parallel thereto, slightly flexuous, whitish, with faint bordering dark shades; no terminal dots. Hind wing pale fuscous, translucent, the fringe pale. Expanse, 14 mm.

*Type.*—Female, No. 16392, U.S.N.M.; Taboga Island, February, 1912 (Busck).

### BEMA, new genus.

Fore wing with vein 2 well before the angle of the cell, 3 and 5 separate, 4 absent; 6 below apex of cell, 8–9 long-stalked, the stalk curved and approximate to 10, 10, and 11 on the cell. Hind wing with the cell very short, vein 2 long before the angle, 3 and 5 separate, 4 absent, 6 from the apex of cell, approximate to 7–8 at base, 7 and 8 anastomosing nearly to apex, 8 indistinct. Labial palpi upturned, short, not reaching the vertex. Maxillary palpi minute. Antennæ of male with the basal joint triangular, the flagellum set on one corner, thickened, simple.

*Type of the genus.*—*Bema myja*, new species.

**BEMA MYJA**, new species.

Pale gray, lines pale, wavy, far out, the outer one near the margin and preceded by black dots; discal dots small, black, separated. Hind wing translucent, the veins and termen fuscous, interspaces faintly lined. In the male the veins show dark rough scaling. Beneath, behind the fore coxa, is a large tuft of creamy white hairs; costa of fore wing with a small fold at base; a patch of metallic black scales on the abdomen dorsally before the tip. Expanse, male, 16 mm.; female, 15 mm.

*Cotypes.*—Male and female, No. 16393, U.S.N.M.; Taboga Island, February, 1912 (Busck).

### RELMIS, new genus.

Fore wing with vein 2 from before angle of cell, 3, 5 separate, 4 absent, 6 below apex of cell, 8–9 long-stalked, 10 and 11 on the cell, free. Hind wing with the cell short, about one-third the length of wing, vein 2 long before the angle, 3 and 5 separate, 4 absent, 6 close to 7 at base, 7 and 8 anastomosing nearly to apex. Labial palpi slender, upturned to vertex.

*Type of the genus.*—*Relmis ydda*, new species.

**RELMIS YDDA, new species.**

Dark gray, a little violaceous; base dark; inner line paler than the ground, oblique, straight, edged with blackish within and very broadly so without; discal dots joined; outer line in-angled on subcostal and submedian and broken-dentate, pale, with dark inner edge; terminal dots small; fringe pale. Hind wing dark fuscous, veins and termen blackish; fringe pale. Expanse, 19 mm.

*Type.*—Female, No. 16394, U.S.N.M.; Trinidad River, June, 1912 (Busck). Also another female, in poor state, from the same place, May, 1911 (Busck).

**RELMIS FIFACA, new species.**

Soft pale gray, the veins lined with dark powderings; inner line very oblique, whitish, dentate on the outer side on subcostal and submedian and followed by a narrow dark shade; discal dots joined in a line; outer line near the margin, angled inward on subcostal and outward on vein 5, faint below, whitish with dark inner shade; terminal dots subconfulent. Hind wing whitish, gray on costa and termen. Expanse, 18 mm.

*Type.*—Female No. 16395, U.S.N.M.; Porto Bello, December, 1912 (G. F. Cleveland).

## MOERBES, new genus.

Fore wing with vein 2 from the cell, 3 close to the end of the cell, 4–5 stalked, 6 below apex of cell, 8–10 stalked, 11 on the cell. Hind wing with the cell short, 2 from long before the angle, 3 and 5 stalked, 4 absent, 6 from the apex of cell, 7 and 8 anastomosing nearly to tip of wing. Labial palpi moderate, porrect, the second joint scaly above, third blunt; maxillary palpi in both sexes small, stout, smoothly scaled. Antennæ of male ciliate, without bend or tuft. A fold at base of costa of fore wing below.

*Type of the genus.*—*Zophodia dryopella* Schaus.[1]

**MOERBES DRYOPELLA Schaus.**

3. Porto Bello, April, 1912 (Busck); Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

## HARNOCHA, new genus.

Fore wing with veins 2–3 shortly stalked, 4–5 long stalked, 6 below apex of cell, 8–9 stalked, 10, 11 on cell. Hind wing with 2 from the angle of the cell, 3 absent, 4–5 long-stalked, 6 from the apex of cell, 7 anastomosing with 8. Palpi porrect, down curved, two-and-a-half times as long as the head. Maxillary palpi minute, scale-like. Tongue distinct. Antennæ of male simple, slightly bent at the base.

*Type of the genus.*—*Harnocha velessa,* new species.

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[1] Ann. Mag. Nat. Hist. (8), vol. 11, 1913, p. 249.

**HARNOCHA VELESSA, new species.**

Fore wing rosy luteous, the costa broadly white to the middle of cell; an oblique black band, touching costal stripe near base; a round patch below cell; two black discal dots; a terminal row of close dots, absent at apex. Hind wing soiled whitish, slightly grayish at costa. Expanse, 12 mm.

*Type.*—Male, No. 16401, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also nine others from the same place but one, Trinidad River, June, 1912 (Busck).

**EURYTHMIDIA IGNIDORSELLA Ragonot.**

14. Porto Bello, March, 1911, April, 1912 (Busck); Corozal, Canal Zone, March, 1911 (Busck); Alhajuelo, March, 1912, April, 1911 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

Smaller and brighter than Mexican specimens, on which the name was founded, and with whitish, not fuscous, hind wings in both sexes.

**ENDOMMASIS NIGRITELLA Hampson.**

23. Corozal, Canal Zone, April, 1912 (Busck); Paraiso, Canal Zone, April and May, 1911 (Busck); Porto Bello, February, 1911, April, May, 1912 (Busck); October and December, 1912 (G. F. Cleveland); La Chorrera, May, 1912 (Busck).

### EURYTHMASIS, new genus.

Fore wing with veins 2–3 long-stalked from the angle of the cell, 4 absent, 5 from the angle of the cell, 6 below apex, 8–9 stalked, 10, 11 on cell. Hind wing with 2 from angle of cell, 4 absent, 3–5 long-stalked, 6 at apex of cell, 7–8 anastomosing half way to apex of cell. Labial papli broken. Maxillary palpi small, filiform, scaly. Tongue distinct. Antennæ broken. Front without tuft, smooth.

*Type of the genus.—Eurythmasis ignifatua,* new species.

**EURYTHMASIS IGNIFATUA, new species.**

Scarcely distinguishable in markings from either *Endommasis nigritella* Hampson or *Eurythmidia ignidorsella* Ragonot. Rather light gray, the pale space above inner margin of fore wing indistinct and but little reddish. Expanse, 13 mm.

*Type.*—Male, No. 16400, U.S.N.M.; La Chorrera, May, 1912 (Busck).

**DANNEMORA QUADRIPUNCTA Zeller.**

2. Cabima, May, 1911 (Busck); La Chorrera, May, 1912 (Busck).

**VITULA RUSTO, new species.**

Wing-shape of *V. bodkini* Dyar, the markings similar, but bright and distinct; inner line white, distinct, with a small tooth on submedian, followed by a broad blackish shade; discal dots large, nearly contiguous; outer line white, slightly excurved centrally with inner dotted black edge; terminal dots small, distinct. Hind wing pale fuscous, with dark veins and termen. Expanse, 15 mm.

*Type.*—Female, No. 16405, U.S.N.M.; Paraiso, Canal Zone, May, 1911 (Busck).

**VITULA TABOGA, new species.**

Male without tuft on costa below; pale gray; inner line sharply angled in the center, followed by a black shade; discal dots separated; outer line whitish, near the margin, appearing denticulate from the dotted black inner segment; dark streaks on the discal venules; terminal dots nearly confluent. Hind wing whitish, very faintly fuscous tinted, veins and double terminal line fuscous. Expanse, male, 13 mm.; female, 14 mm.

*Cotypes.*—Male and female, No. 16404, U.S.N.M.; Taboga Island, February, 1912 (Busck).

Very close to *V. bodkini* Dyar,[1] perhaps the same, but the fore wing seems narrower, the hind wing paler.

**VITULA BODKINI Dyar.**

1. Trinidad River, May, 1911 (Busck).

**CABOTIA RHYTHMATICA, new species.**

Fore wing luteous purplish, powdered with white on the costa; inner line far out, very faint, forming a tooth on subcosta, arcuate below; discal dots blackish; outer line a trace, dark, especially toward costa, far out and parallel to the margin. Hind wing sordid whitish, fuscous on veins, margin and fringe. Expanse, 13 mm.

*Cotypes.*—Male and female, No. 16403, U.S.N.M.; Porto Bello, March, 1911, and April, 1912 (Busck).

Near *C. cundajensis* Zeller, but not the same as the specimens so identified before me.

**EDULICA COMPEDELLA Zeller.**

3. Porto Bello, April and May, 1912 (Busck).

**EURYTHMIA VESTILLA, new species.**

Palpi long and slender, frontal tuft prominent; inner line vague whitish, nearly erect, followed by a broad black shade; discal dots dark; outer line like the inner reversed, more slender, very vague. Hind wing transparent pale fuscous. Expanse, 10 mm.

*Type.*—Female, No. 16406, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck). Also one female from the same place.

**EURYTHMIA COQUILLA, new species.**

Palpi long, oblique, rather shaggy and pointed. Base of wing pale nearly to the middle, its end erect, sharp; discal dots joined; outer line lost. Hind wing translucent pale fuscous. Expanse, 11 mm.

*Type.*—Female, No. 16407, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also another female from the same place.

**EURYTHMIA COCA, new species.**

Palpi rather short and stout. Fore wing luteous gray, black-powdered; lines lost, but indicated by some rather coarse black dots;

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[1] Ins. Ins. Men., vol. 1, 1913, p. 99.

discal dots black, separate. Hind wing white with fuscous termen. Expanse, 10 mm.

*Type.*—Male, No. 16408, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also two females with the same data.

**EURYTHMIA MOSSA, new species.**

Palpi rather short and stout, upturned. Fore wing narrow, blackish gray; inner line pale, erect, irregular, followed by a black shade that reaches the discal dots, which are large and rather diffused; outer line far out, whitish, somewhat irregular and diffused. Hind wing whitish, veins and termen fuscous. Expanse, 10 mm.

*Tpe.*—Female, No. 16409, U.S.N.M.; Tabogilla Island, February, 1912 (Busck). Also another female from the same place.

**EURYTHMIA UNCTA, new species.**

Palpi slender, oblique, a small tuft at end of second joint; front prominent. Fore wing dark gray; inner line white, strongly oblique, denticulate, followed by a black shade; discal dots black, separate; outer line far out, parallel to outer margin, denticulate, slender, white. Hind wing whitish, translucent, veins and termen fuscous. Expanse, 10 mm.

*Type.*—Female, No. 16410, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also two females with the same data and three others in indifferent condition and not certainly the same species with additional localities, Porto Bello, April, 1912 (Busck); La Chorrera, May, 1912 (Busck).

## HARNOCHINA, new genus.

Fore wing with veins 2 and 3 before the angle of the cell, separated, 4–5 stalked, not in line with the median, 6 below apex of cell, 8-9 long-stalked, 10 and 11 on the cell. Hind wing with 2 at the angle of the cell, 4 absent, 3–5 very long-stalked, 6 stalked, 7 and 8 strongly anastomosing. Labial palpi upturned, the second joint oblique or nearly erect, widened a little with scales on both sides, third joint gently deflexed. Maxillary palpi small, filiform. Antennæ of male strongly ciliate, subserrate, not bent.

*Type of the genus.*—*Harnochina rectilinea*, new species.

**HARNOCHINA RECTILINEA, new species.**

Fore wing yellowish, the costa white; a black powdering at apex running down center of terminal space; lines blackish, straight, nearly parallel, the inner one sometimes a little irregular and not crossing the costal white stripe. Hind wing fuscous blackish, darker in the female, uniform; a pale line showing in the base of the fringe. Expanse, 10 mm.

*Type.*—Male, No. 16402, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck). Also one male from the same place, May, 1912 (Busck), and five females, La Chorrera, May, 1912 (Busck): Cabima, May, 1911 (Busck).

**MESCINIA BEROSA, new species.**

Fore wing grayish white, shaded with dull vinous on the basal third, along inner margin and up terminal space; inner line whitish, narrow, indistinct, showing as a cusp centered on vein 1; discal dots black, separated; outer line straight but denticulate, whitish, narrow, parallel to the margin, preceded by a black shade centrally only; terminal line dark, powdery. Hind wing pale fuscous, darker on the termen. Expanse, 11 mm.

*Type.*—Female, No. 16398, U.S.N.M.; Trinidad River, March, 1912 (Busck).

**MESCINIA TRILOSES, new species.**

Fore wing very pale gray, faintly pinkish, the costa white; inner line blackish, powdery and diffused, but broad, upright and nearly straight, not reaching the costa or margin; discal dots joined; outer line oblique, straight, whitish, edged with blackish, distinctly within, narrowly and faintly without. Hind wing soiled whitish, fuscous on the margin. Expanse, 11 mm.

*Type.*—Male, No. 16396, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also four males and seven females with additional localities, Tabogilla Island, February, 1912 (Busck); Alhajuelo, April, 1911 (Busck).

**MESCINIA MOSCES, new species.**

Similar to the above, the inner line broken and indistinct, lost in a general longitudinal powdering which is strong in the discal area; colors rather brighter, the pinkish gray of the inner area contrasting with the white costa; outer line strongly black-edged. Expanse, 12 mm.

*Type.*—Female, No. 16397, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also one male and five females with additional locality, Corozal, Canal Zone, April, 1911, and May, 1912 (Busck).

## HYPERMESCINIA, new genus.

Differs from *Mescinia* in having veins 2 and 3 of fore wing coincident.

*Type of the genus.*—*Hypermescinia lambella*, new species.

**HYPERMESCINIA LAMBELLA, new species.**

Whitish gray, the costa white; lines dark gray, powdery, straight; inner line a little irregular centrally; outer line doubled; discal dots joined. Hind wing whitish in the male, pale fuscous in the female, the veins and termen darker. Expanse, 10 mm.

*Type.*—Male, No. 16399, U.S.N.M.; Tabernilla, Canal Zone, May, 1907 (Busck). Also three females, Porto Bello, February, 1912 (Busck); La Chorrera, May, 1912 (Busck); Trinidad River, June, 1912 (Busck).

**MOODNA SUPPLICELLA, new species.**

Fore wing long and narrow, vinous blackish; basal space vinous-black; median black; lower half of terminal space vinous; lines whitish, slender, powdery and broken, the inner far out, oblique, the outer near and parallel to the margin. Hind wing translucent pale fuscous, veins and termen dark. Expanse, 13 mm.

*Type.*—Female, No. 16417, U.S.N.M.; Trinidad River, June, 1912 (Busck). Also one male and six females, Porto Bello, April and May, 1912 (Busck), October, 1912 (G. F. Cleveland); Cabima, May, 1911 (Busck).

**HOMŒOSOMA MUSIOSUM, new species.**

Fore wing rather square and bluntly rounded; whitish, uniformly sprinkled with black, the general effect pale gray; lines obsolete; basal area a little darker; discal spots distinct, separated; a blackish streak on the costa before apex. Hind wing sordid whitish; a terminal fuscous line. Expanse, 13 mm.

*Type.*—Female, No. 16411, U.S.N.M.; Porto Bello, May, 1911 (Busck). Also one male and five females with additional data, May, 1912 (Busck) and localities, Taboga Island, February, 1912 (Busck); Cabima, May, 1911 (Busck); Trinidad River, March, 1912, and May, 1911 (Busck).

**HOMŒOSOMA MUCIDELLA Ragonot.**

13. Trinidad River, March and September, 1912 (Busck); Porto Bello, February, 1912 (Busck); Corozal, Canal Zone, November, 1912 (C. P. Crafts).

## CALAMOPHLEPS, new genus.

Fore wing with vein 2 near angle of cell, 3–5 stalked, 6 below apex of cell, 8–9 stalked, coincident or nearly so, 10 and 11 on cell. Hind wing with vein 2 from the angle of the cell, 3 and 5 long-stalked, 4 absent, 6 from apex of the cell, 7 anastomosing with 8, nearly coincident. Labial palpi slender, obliquely upturned; maxillary palpi small, filiform. Antennæ of male minutely ciliate with spines at the apices of the joints.

*Type of the genus.*—*Calamophleps squalidella,* new species.

**CALAMOPHLEPS SQUALIDELLA, new species.**

Dark gray; inner line oblique, straight, defined only by a following black shade that spreads over part of median space; discal dot double, generally separated; outer line close to margin, pale, vague, straight, defined by a dark, narrow, inner shade. Hind wing pale fuscous, veins and termen darker; a pale line in base of fringe. Expanse, 12 mm.

*Type.*—Female, No. 16414, U.S.N.M.; Porto Bello, May, 1912 (Busck). Also 3 males and 9 females from the same place with additional data, December, 1912 (G. F. Cleveland), and from La Chorrera, May, 1912 (Busck); Corozal, Canal Zone, April, 1912 (Busck), March, 1911 (Busck).

Two of the specimens have veins 4 and 5 coincident on one wing.

Since preparing these descriptions I find that *Calamophleps squalidella* is undoubtedly the same as *Azæra muciella* Schaus;[1] but as *Azæra* is too near *Azara* D'Orbigny (Mollusca) to be retained I let the descriptions stand as written, leaving *squalidella* to designate the specimens actually under observation, to avoid possible future confusion.

**CALAMOPHLEPS NODOSES, new species.**

Pale gray, whitish on costa; lines dark, the inner broad, nearly straight, not attaining either margin; discal dot clouded, double; outer line straight, parallel to and near the outer margin, with narrow following pale shade. Hind wing translucent fuscous. Expanse, 10 mm.

*Type.*—Female, No. 16415, U.S.N.M.; Corozal, Canal Zone, April, 1911 (Busck).

**CALAMOPHLEPS LOPHOPHORA, new species.**

Front with projecting divided tuft. Dark gray, finely powdered with black; inner line whitish, oblique, irregular, followed by a black shade; discal dots dark, separated; outer line narrow, pale, a little flexuous, all the markings obscure and apparently inconstant. Hind wing silky translucent pale fuscous. Expanse, 11 mm.

*Type.*—Female, No. 16416, U.S.N.M.; Porto Bello, May, 1912 (Busck). Also one female, La Chorrera, May, 1912 (Busck).

## COMOTIA, new genus.

Fore wing with vein 2 before the angle of the cell, 3 and 5 shortly stalked, 4 absent, 6 below apex of cell, straight, long; 8 and 9 coincident, close to 10 at base, 10 and 11 on the cell. Hind wing with the cell very short, vein 2 long before the angle, 4 absent, 3 and 5 separate, 6 close to 7 at base, 7 and 8 coincident. Labial palpi slender, upturned to vertex. Maxillary palpi minute. Antennæ of male with the basal joint triangular, the flagellum on one corner, a small spine on the other; flagellum with its second joint large, flat, excavated behind into a pocket, followed by a ridge of crests on the succeeding joints. Abdomen long and slender, the anal segment tufted.

*Type of the genus.*—*Comotia torsicornis*, new species.

**COMOTIA TORSICORNIS, new species.**

Fore wing long, very narrow, pale gray, a little streaked with black on the veins; discal dots black, separated; lines pale, obscure; terminal dots black. Hind wing translucent pale fuscous with dark veins and termen. Expanse, 13 mm.

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[1] Ann. Mag. Nat. Hist. (8), vol. 11, 1913, p. 250.

*Type.*—Male, No. 16418, U.S.N.M.; Porto Bello, March, 1911 (Busck). A worn female, Taboga Island; February, 1912 (Busck), apparently belongs here, but shows small differences in venation. A trace of vein 8 is visible at apex of fore wing and veins 4 and 5 of fore wing are separate at origin.

## STRYMAX, new genus.

Fore wing with veins 2 and 3 close to the end of the cell, parallel, 4 and 5 coincident, 6 below the apex of the cell, 8–9 coincident, 10 and 11 on the cell. Hind wing with vein 2 before the angle of the cell, bent a little at base, 4 absent, 3 and 5 separate, 6 from the apex of the cell, 7 anastomosing with 8 nearly to the tip. Labial palpi slender, upturned above vertex; maxillary palpi small, filiform. Antennæ of male simple, with a constriction at base of the flagellum.

*Type of the genus.*—*Strymax dorae*, new species.

### STRYMAX DORAE, new species.

Whitish gray; inner line represented by two or three black patches in a line or triangle; discal dots small, black, narrow, separate; outer line defined by two dark shades, itself of the ground color. Hind wing translucent whitish, a little fuscous along the costa. Expanse, 10 mm.

*Type.*—Male, No. 16419, U.S.N.M.; La Chorrera, April, 1912 (Busck). Also 8 males and 9 females with additional localities, Corozal, Canal Zone, March, 1911, and May, 1912 (Busck); Trinidad River, March, 1912, and May, 1911 (Busck); Taboga Island, June, 1911 (Busck); Paraiso, Canal Zone, April, 1911 (Busck).

### STRYMAX PYLLIS, new species.

Whitish gray, markings obsolete; discal dots distinct though minute, only traces of the inner dots; outer line a pale trace. Hind wing clear yellowish white in the male. Expanse, 11 mm.

*Type.*—Male, No. 16420, U.S.N.M.; Porto Bello, February, 1911 (Busck). Also four females tentatively referred here, Taboga Island, February, 1912 (Busck); Corozal, Canal Zone, April, 1912 (Busck); Trinidad River, March, 1912 (Busck).

### EPHESTIODES FLORELLA, new species.

Fore wing rather dark gray, finely peppered with black, of the same color throughout; inner line whitish, broad, rather diffused, straight, followed by a broad black shade; discal dots conjoined; outer line whitish, parallel to and near the margin, narrow, a little irregular, with slight black defining shade; a dark terminal shade-line. Hind wing translucent soiled whitish with fuscous terminal line. Expanse, 13 mm.

*Type.*—Female, No. 16413, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck), also five females with additional data, April, 1911 (Busck), and additional localities, La Chorrera, April and May, 1912 (Busck).

**EPHESTIODES NONIELLA, new species.**

Fore wing gray, dark, the long basal space tinged with olive yellow, bounded by an erect line that curves basally at costa, blackish, shading into the dark mesial color; discal dots dissolved; outer line barely indicated, whitish, oblique, near the margin. Hind wing pale fuscous with darker veins and terminal line. Expanse, 10 mm.

*Cotypes.*—Two females, No. 16412, U.S.N.M.; La Chorrera, May, 1912 (Busck). Also one male, Trinidad River, September, 1912 (Busck).

**EPHESTIA CAUTELLA Walker.**

1. Porto Bello, May, 1911 (Busck).

**EPHESTIA ELUTELLA Hübner.**

1. Cabima, May, 1911.

**EPHESTIA DIVERGENS, new species.**

Dark gray, a little purplish; inner line at middle of wing, erect, black, widening on the costa; discal dots joined; outer line oblique, parallel to the margin incurved on submedian fold, black, followed by a pale border. Hind wing dark fuscous. Expanse, 16 mm.

*Type.*—Female, No. 16423, U.S.N.M.; Taboga Island, June, 1911 (Busck).

Resembles *E. nonparilella* Dyar, but broader winged, darker colored, the inner line erect and not parallel to the outer.

**EPHESTIA COLORELLA, new species.**

Fore wing with the basal space dull red; inner line white, oblique, straight, broad and distinct; median space blackish, with more or less distinct white area around the double, separated, discal dots; outer line straight, white, narrow; terminal space dull red, black at apex. Hind wing pale translucent fuscous, dark on veins and termen. Expanse, 12 mm.

*Type.*—Female, No. 16421, U.S.N.M.; Taboga Island, February, 1912 (Busck). Also one male and nine females with additional localities, Cabima, May, 1911 (Busck); Corozal, Canal Zone, March, 1911 (Busck); Tabogilla Island, February, 1912 (Busck); Porto Bello, May, 1912 (Busck).

**EPHESTIA ANIMOSELLA, new species.**

Similar to the preceding, narrower winged, veins 3 and 5 separate, whereas they are generally shortly stalked in *colorella;* inner line more oblique, narrow and continued along costa to base; outer line narrow. Expanse, 11 mm.

*Type.*—Female, No. 16422, U.S.N.M.; Porto Bello, May, 1912 (Busck). Also 1 male, 12 females, with additional localities, Trinidad River, May, 1911, March and June, 1912 (Busck); La Chorrera, April, 1912 (Busck).

**PLODIA INTERPUNCTELLA Hübner.**

1. Porto Bello, May, 1912 (Busck).

**VARNERIA NANNODES, new species.**

Fore wing bronzy purple-red. Hind wing translucent fuscous. Expanse, 8 mm.

*Type.*—Female, No. 16424, U.S.N.M.; Cabima, May, 1911 (Busck).

I am not sure that *Varneria* is distinct from *Eurythmia;* the small size, bluntly rounded wings and short abdomen, together with the peculiar coloration may, perhaps, hold the genus.

## MICROPHYCITA, new genus.

Fore wing with vein 2 before angle of cell, 3 and 5 stalked, 4 absent, 6 from slightly above middle of cross-vein, 7–8 absent, 9 and 10 stalked, 11 on cell. Hind wing with five veins, cell open, 3 and 4 absent, 6 from 8, 7 absent. Labial palpi slender, upturned, the third joint long and thin. Maxillary palpi small. Tongue distinct. Head rounded, smooth.

*Type of the genus.*—*Microphycita titillella,* new species.

**MICROPHYCITA TITILLELLA, new species.**

Fore wing gray, irrorate with dark; a rufous tint about outer portion; two slender, slightly curved lines, parallel, approximate, the inner at the middle of the wing, pale, edged toward median space with dark; fringe long, gray. Hind wing pointed at apex, the costa a little concave, pale fuscous with long gray fringes. Expanse, 8 mm.

*Type.*—Male, No. 16427, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also 17 others with additional data, May, 1911, and June 1912 (Busck) and locality, Cabima, May, 1911 (Busck).

**MICROPHYCITA CONOPS, new species.**

Dark bronzy black, without markings. Hind wing pale translucent fuscous, with dark terminal line; fringe very long, with pale line at base, followed by a dark one. Expanse, 8 mm.

*Type.*—Female, No. 16428, U.S.N.M.; La Chorrera, April, 1912 (Busck). Also three others with additional data, May, 1912 (Busck) and localities, Cabima, May, 1911 (Busck); Trinidad River, May, 1911 (Busck).

## MICROPHESTIA, new genus.

Fore wing with veins 2, 3, and 5 separate from near angle of cell, 4 absent, 6 below apex of cell, 8–9 coincident, 10, 11 on the cell. Hind wing with vein 2 long before the angle of the cell, 4–5 long-stalked, 6 from apex of cell, 7–8 coincident. Labial palpi slender, terete, obliquely ascending; maxillary palpi small, filiform.

*Type of the genus.*—*Microphestia animalcula,* new species.

**MICROPHESTIA ANIMALCULA, new species.**

Fore wing glossy black-brown. Hind wing pale fuscous. Expanse, 8 mm.

*Type.*—Female, No. 16426, U.S.N.M.; Trinidad River, March, 1912 (Busck).

## MICROMESCINIA, new genus.

Fore wing with veins 2–3 stalked, 4–5 stalked, 6 below apex of cell, 8–9 coincident, 10, 11 on cell. Hind wing with 2 close to angle of cell, 4 absent, 3–5 stalked, 6 from apex of cell, 7–8 coincident. Labial palpi slender, oblique; maxillary palpi filiform, small. Male with fold and tuft on costa at base of fore wing beneath.

*Type of the genus.*—*Micromescina pygmæa*, new species.

**MICROMESCINIA PYGMÆA, new species.**

Fore wing yellowish ocher, deep purple-red on costa and in a broad terminal band. Hind wing fuscous, lighter at base; a pale line in base of fringe. Expanse, 9.5 mm.

*Type.*—Male, No. 16425, U.S.N.M.; Porto Bello, March, 1911 (Busck). Also one male and one female, Taboga Island, February, 1912 (Busck); Tabernilla, Canal Zone, May, 1907 (Busck).

**NAVASOTA MYRIOLECTA, new species.**

Pinkish, strewn with dark atoms, the veins marked with light lines, most distinct along costa; the dark scales border the cell veins and those running to apex. Hind wing soiled whitish, the costa gray. Expanse, 19 mm.

*Type.*—Female, No. 16434, U.S.N.M.; Cabima, May, 1911 (Busck).

**PECTINIGERA VIOLODIS, new species.**

Fore wing uniform light purple. Hind wing soiled whitish, the costa gray. Expanse, 20 mm.

*Type.*—Female, No. 16430, U.S.N.M.; Cabima, May, 1911 (Busck).

**PECTINIGERA MUSÆELLA Schaus.**

7. Corozal, Canal Zone, April, 1911, and June, 1912 (Busck), July, 1912 (J. Zetek), November, 1912 (C. P. Crafts); Trinidad River, June, 1912 (Busck).

**POUJADIA CYTTARELLA, new species.**

Fore wing pink with scattered brown scales, cell whitish, the color not reaching costa. Hind wing very pale fuscous; abdomen ocher. Expanse, 16 mm.

*Type.*—Male, No. 16429, U.S.N.M.; Cabima, May, 1911 (Busck). Also two others from the same place.

## TINITINOA, new genus.

Fore wing with veins 2, 3, and 5 separate near end of cell, 4 absent, 6 below apex of cell, 8–10 stalked, 11 on the cell. Hind wing with 2 before the angle of the cell, 3–5 long-stalked, 4 absent, 6 from apex of cell, 7 anastomosing with 9. Labial palpi porrect; maxillary palpi filiform. Antennæ of male with long pectinations at base, decreasing to serrations at the middle; a slight flat tuft at base.

*Type of the genus.*—*Tinitinoa phyrdes*, new species.

**TINITINOA PHYRDES, new species.**

Fore wing with distinct white costal stripe, ending in a point at apex; a dark streak at base; rest of wing pinkish with scattered dark dots, irregularly representing the ordinary lines; veins longitudinally lined in pale; terminal dots small, black, distinct. Hind wing pale fuscous tinged, with dark terminal line. Expanse, 15 mm.

*Type.*—Male, No. 16431, U.S.N.M.; Trinidad River, March, 1912 (Busck). Also 9 males and 2 females from the same place with additional data May, 1911, and June, 1912 (Busck), and additional locality, Porto Bello, February, 1912 (Busck), the latter specimen very small (expanse, 9.5 mm.).

### SCHENECTADIA, new genus.

Fore wing with vein 2 from the cell, 4 absent, 3 and 5 from the angle, separate, 6 below apex of cell, 8–10 stalked, 11 on the cell. Hind wing with 2 and 5 separate, from the angle of the cell, 3 and 4 absent, 6 from apex of cell, 7 and 8 anastomosing. Labial palpi long, obliquely erect, far exceeding the vertex. Maxillary palpi scaly, small. Front smooth.

*Type of the genus.—Schenectadia merilesella*, new species.

**SCHENECTADIA MERILESELLA new species.**

Fore wing pinkish with scattered black scales; costal edge, vein 12 and subcosta white, giving the appearance of a white costal stripe; median vein black; brownish streaks on the folds, subcostal and submedian. Hind wing sordid whitish. Expanse, 13 mm.

*Type.*—Male, No. 16432, U.S.N.M.; Corozal, Canal Zone, March, 1911 (Busck). Also two males, La Chorrera, May, 1912 (Busck); Taboga Island, June, 1911 (Busck).

**CŒNOCHROA MONOMACULA, new species.**

Dull ocher, longitudinally streaked with blackish, radiating at base from dark center on submedian fold; a distinct, oval, black spot at lower angle of cell. Hind wing stained with fuscous. Expanse, 14 mm.

*Type.*—Male, No. 16433, U.S.N.M.; Cabima, May, 1911 (Busck). Also one male and one female, La Chorrera, May, 1912 (Busck).

## Family CASTNIIDÆ.

**CASTNIA CACICA Herrich-Schäffer.**

1. Porto Bello, February, 1912 (Busck).

**CASTNIA VIRYI Boisduval.**

2. La Chorrera, March, 1912 (Busck); Porto Bello, April, 1912 (Busck).

**CASTNIA LICUS Cramer.**

1. Cabima, May, 1911 (Busck).

**CASTNIA ATYMNIUS Dalman.**

2. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, February, 1911 (Busck).

**CASTNIA HUMBOLDTI Boisduval.**

2. Taboga Island, January, 1911 (Busck).

## Family COSSIDÆ.

**ZEUZERA PYRACMON Cramer.**

11. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, February, 1911 (Busck); Cabima, May, 1911 (Busck).

**ZEUZERA COMISTEON Schaus.**

4. Paraiso, Canal Zone, January, 1911 (Busck).

**ZEUZERA RAMOSA Schaus.**

4. Paraiso, Canal Zone, January, 1911 (Busck); Porto Bello, February, 1911 (Busck).

**PSYCHONOCTUA TERRAFIRMA Schaus.**

3. Taboga Island, February, 1912 (Busck).

**PSYCHONOCTUA NULLIFER, new species.**

Fore wing creamy, thickly dusted with chocolate brown atoms. Hind wing cream-colored with slight brown shading at anal angle. Expanse, 58 mm.

*Type.*—Female, No. 16435, U.S.N.M.; Taboga Island, February, 1912 (Busck).

Two males which I associate with this have the same creamy brownish tint; some blackish reticulations at base, less distinct ones terminally and a discal dot. From the same locality and date.

**COSSULA ARPI Schaus.**

1. Cabima, May, 1911 (Busck).

**LANGSDORFIA FRANCKII Hübner.**

1. Cabima, May, 1911 (Busck).

**HEMIPECTEN NIVEOGRISEA Schaus.**

1. Cabima, May, 1911 (Busck).

**LENTAGENA AUDARIA Schaus.**

2. Paraiso, Canal Zone, January, 1911 (Busck); Taboga Island, February, 1912 (Busck).

**GIVIRA JUTURNA Schaus.**

1. Porto Bello, March, 1911 (Busck).

**TORONIA ADOLESCENS, new species.**

Fore wing gray, mottled and streaked with white, in end of cell, around submedian vein and densely over discal venules; reticulations suffused; a black line with dull orange scales adjoining, across cell from subcosta to vein 1; a similar submarginal line from costa, broadly sinuate, ending on margin at vein 2; several less distinct and broken streaks between these and the apex. Hind wing pale gray. Expanse, 36 mm.

*Type.*—Female, No. 16436, U.S.N.M.; Taboga Island, February, 1912 (Busck).

This may prove to be the female of *T. infantilis* Schaus (*Cossus infantilis* Schaus)[1], though very dissimilar in appearance.

**ARBELA NECREROS, new species.**

Soft dark brown; a broader, darker blackish shade band, oblique from costa before apex to inner margin before middle; reticulations obsolete; a narrow gray line on angle of inner margin at base. Hind wing sooty blackish, subtranslucent, the veins appearing darker. Beneath, all blackish, reticulations only faintly shown. Expanse, 27 mm.

*Type.*—Female, No. 16437, U.S.N.M.; Trinidad River, March, 1912 (Busck).

## Family HEPIALIDÆ.

**HEPIALUS MOMUS Druce.**

1. La Chorrera, May, 1912 (Busck).

**DALACA ASSA Druce.**

1. Trinidad River, March, 1912 (Busck).

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[1] Ann. Mag. Nat. Hist., (8), vol. 7, 1911, p. 632.

# THE VARIATIONS EXHIBITED BY THAMNOPHIS ORDINOIDES (BAIRD AND GIRARD), A GARTER-SNAKE INHABITING THE SAUSALITO PENINSULA, CALIFORNIA.

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## INTRODUCTION.

The garter-snakes of the Pacific coast found west of the Sierra-Nevada-Cascade Range, from Vancouver in the north to the Tehachapi Mountains in the south, have been assembled in the Memoir of Dr. A. G. Ruthven, under the one name of *Thamnophis ordinoides* (Baird and Girard).[1]

This species presents a remarkably large series of variations, is equaled by no other in the genus, and is only approached by *T. elegans* and *T. radix* which occupy regions five to eight times greater in extent.

The specimens upon which this study is based were captured on the Sausalito Peninsula, which forms the northern boundary of the Golden Gate, the entrance to San Francisco Bay. They were all taken within a radius of 3 kilometers.

## METHODS.

In addition to enumerating the number of scale rows on the various parts of the body, it has been found that most instructive records may be obtained if note is taken of the exact gastrostege level at which an added row begins or a suppressed row ends.

Assuming that a normal specimen is being examined, the following is about what may be expected: At the beginning of the neck there may be counted 10 rows of scales on each side of the median, a total of 21 rows; a little further back there are 9 rows and the median, a total of 19 rows; where this reduced count begins it will be seen that it is caused by the IV row (counting the row next to the gastrostege as the first row) being suppressed, and this occurs usually at the level of the sixth gastrostege. From this point on there are 19 rows until about the twenty-fifth gastrostege, where the count is increased to 21 rows; this is brought about by the addition of a row on each side, the added row being the V. This V row, with the accompanying total of 21 rows, continues to about the sixty-fifth gastrostege, when the V row is suppressed and the count of 19 rows is resumed. The 19 rows continue to the level of the eighty-fifth gastrostege, when the

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[1] Bull. 61, U. S. National Museum, 1908, p. 147.

IV row is suppressed, leaving 17 rows, which continue throughout the rest of the body.

A specimen such as just described would have the scale rows recorded as—

Neck, 19. Body, 19–21–19–17;

the sequence of addition and suppression of the scale rows as—

Neck, —IV. Body, +V, —V, —IV;

and the complete data showing the gastrostege level at which the added rows begin and the suppressed rows end may be presented as follows:

| Neck. | | Body. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 21—IV. | | 19+V. | | 21—V. | | 19—IV. | | 17 cont'd. | |
| rt. | lt. | rt. | lt. | rt. | lt. | rt. | lt. | rt. | lt. |
| 6 | 6 | 25 | 25 | 65 | 65 | 85 | 85 | ...... | ...... |

One of the variations in the scale formulæ is where the body instead of having 19–21–19–17 rows, has only 19–17, that is, 19 rows anteriorly and 17 posteriorly. In this type it is the fourth row in actual counting which is lost.

In order that the data be correctly coordinated the scale rows must be given permanent numbers on that part of the body on which the highest count occurs in the species. In this case it is 21 rows, and the series are numbered from I to X in addition to the median. A specimen in which the highest count is 19 rows must be assumed to have the V rows suppressed constructively. It will have 9 rows on each side of the median; for these to be recorded in terms of the maximum number for the species they must be counted as I, II, III, IV (V suppressed constructively), VI, VII, VIII, IX, and the median row.

Another variation is where the count is 19–17–15. In this type the 19 rows become reduced to 17 by the suppression of the IV row, and occasionally the 17 rows become 15 by the loss of the fifth row in actual count, but this row when recorded in terms of the maximum rows for the species must be counted as the VI row.

Behind the posterior pair of geneials there are usually one or two pairs of small gular shields; these are followed by from one to three shields in the median line which increase in width in pyramidal fashion. The shield that is regarded as the first gastrostege is the first one that is nearly the standard width; it is usually distinguished by being colored similarly to the rest of the ventrals and not white or cream-colored like the throat.

## VARIATION IN NUMBER OF DORSAL SCALE ROWS.

Combining the records obtained by Doctor Ruthven[1] with the data secured from the present series it appears that there are eight distinct scale formulæ for *T. ordinoides*. The reduced counts prevail in specimens from the northern part of the range. These formulæ and the frequency of occurrence of the five types found on the Sausalito Peninsula are as follows:

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[1] Bull. 61, U. S. Nat. Mus., p. 148.

| | Per cent. |
|---|---|
| 21-19-17 | 6 |
| 19-21-19-17 | 66 |
| 19-17 | 10 |
| 19-17-15 | 12 |
| 19-17-15-13 | 2 |
| 17-19-17-15 | 0 |
| 17-15 | 0 |
| 15-17-15 | 0 |
| Bilaterally asymmetrical | 4 |

SCALE FORMULA 21-19-17 (—V, —IV).

| U.S.N.M. No. | Sex. | Ventrals. | Neck. | Body. | | |
|---|---|---|---|---|---|---|
| | | | 23—IV. | 21—V. | 19—IV. | 17 cont. |
| 50283 | Male | 159 | {—III.<br>6 7} | 79 80 | 115 114 | ............ |
| 50304 | Female | 154 | 6 5 | 75 72 | 110 109 | ............ |
| 50309 | ...do | 154 | 5 5 | 71 74 | 121 123 | ............ |

SCALE FORMULA 19-21-19-17 (+ V, —V, —IV).

This combination was found in 66 per cent of the specimens; of these, 61 per cent were males and 39 per cent females. It may be regarded as the normal count for this immediate region.

*Male.*

| U.S.N.M. No. | Ventrals. | Neck. | Body. | | | |
|---|---|---|---|---|---|---|
| | | 21—IV. | 19+V. | 21—V. | 19—IV. | 17 cont. |
| 50254 | 153 | 4 4 | 35 38 | 44 44 | 86 86 | .......... |
| 50259 | 150 | 7 7 | 24 26 | 59 61 | 91 85 | .......... |
| 50263 | 159 | 8 7 | 25 23 | 65 70 | 87 86 | .......... |
| 50264 | 155 | 5 5 | 32 36 | {—IV<br>53 53} | {—V<br>80 79} | .......... |
| 50265 | 164 | Cont. 8 | Cont. 20 | 69 71 | 95 93 | .......... |
| 50266 | 156 | —V}<br>8} 8 | 23 23 | 62 67 | 83 86 | .......... |
| 50267 | 155 | 5 5 | 22 24 | {—IV<br>59 58} | {—III<br>76 78} | .......... |
| 50268 | 159 | 6 6 | 35 34 | 42 48 | 85 86 | .......... |
| 50269 | 156 | 4 5 | 28 29 | 58 59 | 84 85 | .......... |
| 50270 | 157 | 9 8 | —V}<br>24} 35 | 54 53 | 82 83 | .......... |
| 50271 | 155 | 7 7 | 34 35 | —IV}<br>50} 60 | —V}<br>85} 87 | .......... |
| 50272 | 156 | 6 6 | 28 31 | 59 63 | 89 91 | .......... |
| 50276 | 157 | —V}<br>11} 11 | 29 31 | 63 64 | 93 94 | .......... |
| 50278 | 159 | 12 16 | 20 23 | 61 67 | 88 89 | .......... |
| 50296 | 160 | 7 6 | 29 23 | 57 55 | 84 84 | .......... |
| 50297 | 160 | 7 8 | {35<br>40} 35 | {35<br>40} 36 | 84 86 | .......... |
| 50310 | 162 | —V}<br>7} 7 | 28 25 | 69 73 | 89 93 | .......... |
| 50312 | 152 | 6 6 | 19 20 | 71 75 | 90 91 | .......... |
| 50314 | 159 | 13 13 | 25 23 | 65 70 | 87 86 | .......... |
| 50306 | 158 | 5 4 | 27 29 | 56 66 | 87 91 | .......... |
| 50284 | 164 | —V}<br>7} 6 | 24 27 | —IV}<br>66} 64 | —V}<br>94} 93 | .......... |

*Female.*

| U.S.N.M. No. | Ventrals. | Neck. | Body. | | | |
|---|---|---|---|---|---|---|
| | | 21+IV. | 19+V. | 21—V. | 19—IV. | 17 cont. |
| 50253 | 150 | 7 7 | 29 28 | 58 55 | 86 86 | ............ |
| 50257 | 153 | 8 9 | 23 23 | 72 72 | 90 91 | ............ |
| 50261 | 152 | 10 10 | 19 20 | 73 75 | 90 91 | ............ |
| 50262 | 150 | 8 7 | 24 26 | 64 62 | 84 85 | ............ |
| (1) | 157 | 6 4 | 26 32 | 62 57 | 88 90 | ............ |
| 50273 | 161 | 6 6 | 35 36 | 56 57 | 89 89 | ............ |
| 50279 | 156 | 7 4 | 22 24 | 74 74 | 96 93 | ............ |
| 50292 | 150 | 6 5 | 23 22 | 62 65 | 85 86 | ............ |
| 50295 | 157 | 6 6 | —VI 32 38 | 52 50 | 86 87 | ............ |
| 50298 | 152 | Irregular. | 20 26 | 54 51 | 85 87 | ............ |
| 50308 | 154 | 6 5 | 46 45 | 55 53 | 89 85 | ............ |
| 50315 | 157 | 8 7 | 26 24 | 72 72 | 87 90 | ............ |

[1] Leiden Museum.

SCALE FORMULA 19-17 (—IV).

| U.S.N.M. No. | Sex. | Ventrals. | Neck. | Body. | |
|---|---|---|---|---|---|
| | | | 21—IV. | 19—IV. | 17 cont. |
| 50256 | Male...... | 157 | 7 6 | 88 88 | ............ |
| 50274 | ...do....... | 154 | 6 5 | 82 82 | ............ |
| 50293 | Female.... | 145 | 7 7 | 84 83 | ............ |
| 50294 | ...do....... | 150 | 6 7 | 84 85 | ............ |
| 50305 | ...do....... | 149 | 6 6 | 91 90 | ............ |

SCALE FORMULA 19-17-15 (—IV, —III).

| U.S.N.M. No. | Sex. | Ventrals. | Neck. | Body. | | |
|---|---|---|---|---|---|---|
| | | | 21—IV. | 19—IV. | 17—III. | 15 cont. |
| 50258 | Male...... | 153 | 2 2 | 77 81 | —VI 129 142 | ............ |
| 50299 | ...do....... | 159 | 7 | 82 83 | 132 136 | ............ |
| 50302 | ...do....... | 156 | —5 —II 5 | 84 85 | 141 140 | ............ |
| 50311 | ...do....... | 155 | 5 5 | 77 77 | 115 117 | ............ |
| 50289 | Female.... | 145 | 6 6 | 80 82 | 122 121 | ............ |
| 50303 | ...do....... | 149 | 6 6 | 73 77 | 125 136 | ............ |

SCALE FORMULA 19-17-15-13-15 (—IV, —III RT. —VI LT., —X, +X).

No. 50275, female, ventrals 150. On the neck the IV row on the right and the V row on the left are suppressed at the level of the seventh ventral. On the body the IV row is suppressed on the right at the seventy-third, and the left at the seventy-fifth ventral, leaving 17 rows; the III row on the right at the one hundred and fifth, and the VI row on the left at the one hundred and fifteenth ventral are suppressed, leaving 15 rows; the row on either side of the median, the X, is suppressed on each side at the one hundred and tenth ventral, leaving 13 rows; these 13 rows continue to a little before the end of the body, when the X row reappears, on the right at the one hundred and thirty-eighth, and on the left at the one hundred and thirty-ninth ventral.

This specimen varies from the normal in four additional characters, the shields involved being the postoculars, the posterior temporals, the supralabials, and the urosteges. This is the largest number of variations found in a single specimen. It also possesses the lowest number of scale rows, 13, that has been recorded in this species. The reduction is brought about by the suppression of the scale row adjoining the median. Doctor Ruthven has demonstrated that the normal sequence of suppression in *Thamnophis*, in terms of the maximum number of rows, 23, for the genus is the V, VI, IV, and VII rows.[1] These are adjoining rows, whereas the reduction in this specimen from 15 to 13 rows was brought about not by the suppression of an adjoining row, but by that of one several series away, the one next to the median. Some 10 species of Dipsadomorphinæ have been examined and where the scale formula was 21–19–17, 19–17–15, or 17–15–13 the sequence of suppression was first a lateral row, the IV, and then the row adjoining the median; or the sequence was reversed, and the row adjoining the median was the first to be suppressed followed by the row on the flank.

### BILATERALLY ASYMMETRICAL.

No. 50260, male, ventrals 163. Anteriorly there are 19 rows. On the right side the V row is absent; on the left side it is very short, as it begins at the level of the thirty-ninth gastrostege and is suppressed at the forty-second. Over this segment of the body there are 20 rows, and posterior to it the count of 19 is resumed. The IV row is suppressed on the right at the eighty-sixth and on the left at the eighty-fifth gastrostege, leaving 17 rows, which are continued throughout. It will be noted that this series of three scales in the V row on the left side is an intermediate condition between the normal 19–21–19–17 type and the reduced 19–17 type.

No. 50313, male, ventrals 157. On the neck the IV row is suppressed on the right at the fifth and on the left side at the sixth ventral. Anteriorly there are 19 rows; on the right side the V row is absent, on the left it begins at the thirty-fifth, and is suppressed at the forty-first ventral; over this short segment of the body there are 20 rows. Posteriorly the IV row is suppressed on the right at the eighty-third and on the left at the eighty-second ventral, leaving 17 rows which are continuous throughout. It will be noted that this specimen closely approaches the 19–17 type except for the short series of scales in the V row on the left side, which extends over the space of but 6 ventrals.

### OTHER VARIATIONS.

Besides the variations in the scale formulæ the specimens vary in eight additional dermal characters. The shields involved are the preoculars, the postoculars, the anterior temporals, the posterior temporals, the supralabials, the infralabials, the anal, and the urosteges.

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[1] Bull. 61, U. S. Nat. Mus., p. 17.

### VARIATION IN PREOCULARS.

The normal condition is a single preocular. Where two exist it is due to the fragmentation of the lower one-third of the normal shield. In many normal specimens the lower one-third of the shield is indented at the margins and is lighter in color.

| | Per cent. |
|---|---|
| 1 normal | 86 |
| 1–2 asymmetrical | 10 |
| 2 bilateral | 4 |

### VARIATION IN POSTOCULARS.

The normal condition is three shields. Where two exist it is due to the fusing of the normal middle and lower shields and where there are four it is due to the normal lower shield being horizontally divided. In some normal specimens the lower shield is enlarged and shows traces of a tendency to become divided.

| | Per cent. |
|---|---|
| 3 normal | 80 |
| 3–2 asymmetrical | 10 |
| 3–4 asymmetrical | 6 |
| 2 bilateral | 2 |
| 4 bilateral | 2 |

### VARIATION IN ANTERIOR TEMPORALS.

| | Per cent. |
|---|---|
| 1 normal | 94 |
| 1–2 asymmetrical | 4 |
| 2 bilateral | 2 |

### VARIATION IN POSTERIOR TEMPORALS.

| | Per cent. |
|---|---|
| 2 normal | 82 |
| 2–3 asymmetrical | 12 |
| 3 bilateral | 6 |

### VARIATION IN SUPRALABIALS.

The normal condition is to have 8 supralabials with the fourth and fifth entering the eye. Where the number is reduced to 7 it is due to the fusing of the normal second and third shields; in this type the third and fourth enter the eye. Where the count is increased to 9 it is due to the dividing of the normal eighth shield into 2 in which the posterior is the smaller.

| | Per cent. |
|---|---|
| 8 normal | 94 |
| 8–7 asymmetrical | 4 |
| 8–9 asymmetrical | 2 |

### VARIATION IN INFRALABIALS.

The normal condition is to have 10 infralabials. Where the number is increased to 11 it is due to the normal fourth shield being divided. Where it is decreased to 9 it is due to the normal third and fourth shields (33 per cent), the normal seventh and eighth shields (16 per cent), or the normal eighth and ninth shields (50 per cent) being fused. Where the count has been still further reduced to 8, it has been due to the normal third and fourth shields and the normal eighth and ninth shields being fused.

| | Per cent. |
|---|---|
| 10 normal | 74 |
| 10–11 asymmetrical | 6 |
| 10–9 asymmetrical | 12 |
| 10–8 asymmetrical | 2 |
| 9 bilateral | 4 |
| 9–8 asymmetrical | 2 |

### VARIATION IN ANAL.

| | Per cent. |
|---|---|
| Entire | 90 |
| Divided | 10 |

### VARIATION IN UROSTEGES.

The normal condition is for the urosteges to be paired throughout. Many occur in which there are from one to four entire shields; another peculiarity is that these are confined to the first half dozen at the base of the tail.

| | Per cent. |
|---|---|
| Paired | 72 |
| 1 to 4 entire | 28 |

Extracting from these data shows that the following may be assumed to be the normal conditions:

| | | Per cent. |
|---|---|---|
| Scale rows | 19–21–19–17 | 66 |
| Preocular | 1 | 86 |
| Postoculars | 3 | 80 |
| Anterior temporals | 1 | 94 |
| Posterior temporals | 2 | 82 |
| Supralabials | 8 | 94 |
| Infralabials | 10 | 74 |
| Anal | entire | 90 |
| Urosteges | paired | 72 |

The following table shows the percentage of normal individuals and the percentage of those that are abnormal in one or more characters:

| | Per cent. |
|---|---|
| Normal in all characters | 14 |
| Abnormal in one character | 44 |
| Abnormal in two characters | 20 |
| Abnormal in three characters | 14 |
| Abnormal in four characters | 6 |
| Abnormal in five characters | 2 |

An inspection of the above tables does not evidence any grouping of the variations. There is apparently no tendency for a variation from the normal in one character to be associated with a variation in another character.

## SUMMARY OF VARIATIONS.[1]

| U.S.N.M. No. | Sex. | Scales. | Oculars. | | Temporals. | | Labials. | | Anal. | Urosteges. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Pre. | Post. | Ant. | Post. | Supra. | Infra. | | |
| 50283 | Male | 21-19-17 | 2 | ...... | ...... | ...... | ...... | 10-11 | + | ...... |
| 50304 | Female | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | III-IV |
| 50309 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50254 | Male | 19-21-19-17 | ...... | ...... | ...... | 2-3 | ...... | ...... | ...... | ...... |
| 50259 | do | do | ...... | 2-3 | ...... | ...... | 8-7 | 10-9 | ...... | III-V |
| 50263 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50264 | do | do | ...... | ...... | ...... | ...... | ...... | 10-9 | + | II-IV |
| 50265 | do | do | ...... | ...... | ...... | 3 | ...... | ...... | ...... | ...... |
| 50266 | do | do | 1-2 | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50267 | do | do | ...... | ...... | ...... | ...... | ...... | 9-8 | ...... | ...... |
| 50268 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50269 | do | do | ...... | ...... | ...... | 2-3 | ...... | ...... | ...... | ...... |
| 50270 | do | do | 1-2 | ...... | ...... | ...... | ...... | ...... | + | ...... |
| 50271 | do | do | ...... | 3-2 | ...... | ...... | ...... | 9 | ...... | III |
| 50272 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50276 | do | do | ...... | 3-2 | ...... | ...... | ...... | ...... | ...... | ...... |
| 50278 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | II-III |
| 50284 | do | do | ...... | ...... | ...... | ...... | 8-7 | 9 | ...... | III-IV |
| 50296 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50297 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | III |
| 50310 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50312 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50314 | do | do | ...... | 3-4 | ...... | ...... | ...... | ...... | ...... | ...... |
| 50306 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | III |
| 50253 | Female | do | ...... | ...... | 2 | ...... | ...... | ...... | + | ...... |
| 50257 | do | do | 1-2 | 3-4 | ...... | 3 | ...... | 10-11 | ...... | ...... |
| 50261 | do | do | ...... | 4 | ...... | ...... | ...... | 10-11 | ...... | ...... |
| 50262 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| [2] | do | do | 1-2 | ...... | ...... | ...... | ...... | 10-9 | ...... | ...... |
| 50273 | do | do | 1-2 | ...... | 1-2 | ...... | ...... | ...... | + | III-IV |
| 50279 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | III-V |
| 50292 | do | do | ...... | 2 | ...... | ...... | ...... | ...... | ...... | ...... |
| 50295 | do | do | ...... | ...... | 1-2 | ...... | ...... | ...... | ...... | ...... |
| 50298 | do | do | 2 | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50308 | do | do | ...... | 3-2 | ...... | 2-3 | ...... | ...... | ...... | ...... |
| 50315 | do | do | ...... | 3-4 | ...... | ...... | 8-9 | ...... | ...... | ...... |
| 50256 | Male | 19-17 | ...... | ...... | ...... | ...... | ...... | 10-9 | ...... | III-IV |
| 50274 | do | do | ...... | ...... | ...... | ...... | ...... | 10-9 | ...... | IV-VI |
| 50293 | Female | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50294 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50305 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50258 | Male | 19-17-15 | ...... | ...... | ...... | 2-3 | ...... | ...... | ...... | ...... |
| 50299 | do | do | ...... | ...... | ...... | 3 | ...... | ...... | ...... | ...... |
| 50302 | do | do | ...... | ...... | ...... | 2-3 | ...... | 10-8 | ...... | ...... |
| 50311 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50289 | Female | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50303 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | II-III |
| 50275 | do | 19-17-15-13 | ...... | 3-2 | ...... | 2-3 | ...... | 9-8 | ...... | II |
| 50313 | Male | Asymmetrical | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| 50260 | do | do | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |

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[1] For the sake of clearness the normal records are indicated by dashes.

[2] Specimen in the Leyden museum.

## POSITION OF THE VISCERA.

The external landmarks of the principal viscera, in terms of gastrosteges, are as follows:

| Sex | Male. | | | | | | | Female. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Scale rows | 19-21-19-17 | | | | | | | 19-21-19-17 | | | | | | | |
| Gastrosteges | 157 | 153 | 150 | 163 | 159 | 155 | 164 | 150 | 153 | 152 | 150 | 161 | 156 | 147 |
| Heart apex | 29 | 29 | 26 | 27 | 28 | 28 | 27 | 27 | 28 | 27 | 26 | 28 | 26 | 29 |
| Liver, tip | 38 | 40 | 32 | 35 | 36 | 36 | 37 | 36 | 36 | 35 | 35 | 37 | 34 | 39 |
| Liver, end | 72 | 73 | 60 | 67 | 69 | 66 | 70 | 71 | 69 | 65 | 59 | 71 | 62 | 69 |
| Gall bladder | 83 | 85 | 78 | 82 | 87 | 80 | 86 | 82 | 86 | 84 | 79 | 86 | 79 | 86 |
| Kidney, right tip | 109 | 106 | 92 | 101 | 104 | 98 | 111 | 107 | 107 | 110 | 108 | 109 | 111 | 107 |
| Kidney, right end | 128 | 127 | 104 | 127 | 131 | 127 | 127 | 129 | 126 | 128 | 125 | 131 | 131 | 125 |
| Kidney, left tip | 120 | 114 | 120 | 116 | 116 | 131 | 120 | 116 | 117 | 121 | 120 | 120 | 124 | 117 |
| Kidney, left end | 138 | 139 | 136 | 144 | 142 | 141 | 142 | 129 | 135 | 137 | 133 | 144 | 141 | 134 |
| U.S.N.M. number | 50256 | 50258 | 50259 | 50260 | 50263 | 50264 | 50265 | 50253 | 50257 | 50261 | 50262 | 50273 | 50279 | 50291 |

In this table are recorded specimens in which the scale formula is 19–21–19–17, the normal for this particular geographical region. If compared with the two previous tables for the normal scale formula several points of interest may be elicited. The V row is usually added, giving the maximum count of 21 rows, at the level of the base of the heart, and becomes suppressed beyond the posterior half of the liver where that organ begins to taper. The IV row is very constantly suppressed, leaving 17 rows, just posterior to the gall bladder.

There is no variation from the normal position of the viscera in specimens with the abnormal or less frequently occurring scale formulæ. Where the count is 19–17, the IV row is usually suppressed, exactly as in those with the normal formula, a little behind the gall bladder.

As to the length of the spinal column, it is clear that whatever increase or decrease in the number of dorsal vertebræ that takes place in an individual specimen is brought about by the addition or subtraction of vertebræ in that part of the column that is between the posterior end of the left kidney and the base of the tail.

## HABITAT.

The Sausalito Peninsula is bounded on the east by San Francisco Bay and on the west by the Pacific Ocean; it is about 10 km. long and 5 km. wide. The hills, many of which reach an altitude of from 200 to 300 meters, are almost bare of trees. The valleys are deeply eroded and are clothed with fairly dense groves of laurel, scrub oaks, manzanita, and willows. In all the canyons the brooks cease to flow during the dry season, but in places water continues to trickle and there are many damp spots and a few water holes.

## FOOD.

There is a big salamander population, but the frogs and toads are very scarce. As the garter-snakes do not eat the salamanders, and as there are not enough frogs to support them, it proved instructive to look into their food supply. This was found to consist almost entirely of large slugs, of the genus *Ariolimax*. One specimen had eaten a small rodent, and another had devoured two young of its own species.

This diet of slugs, eked out with an occasional indulgence in cannibalism, is an interesting example of the straits a species may be brought to when its normal food supply is not obtainable.

# RESULTS OF THE YALE-PERUVIAN EXPEDITION OF 1911. ADDENDUM TO THE HYMENOPTERA ICHNEUMONOIDEA.

By P. R. Myers,

*Aid, Division of Insects, United States National Museum.*

The two specimens represented in the description of this species came from some additional material submitted for study after the report[1] by Mr. H. L. Viereck was written.

### TRACHYSPHYRUS VENUSTUS, new species.

*Type-locality.*—Coropuna, Peru, 14,500 feet.

*Type-specimen.*—Cat. No. 18186, U.S.N.M.

*Male.*—Length, 12 mm. Head shining and very finely shagreened; sides of face below broadly white, the white narrowly extending upward along inner orbits to a point slightly above the base of the frontal pit; clypeus, mandibles, malar space black with indistinct metallic purplish reflections and very sparsely punctured; cheeks highly polished and white with few widely separated punctures and hairs; front black with metallic purplish reflections; vertex black with metallic reflections and two small white spots; area between ocelli sparsely punctured; eyes black; palpi black; scape black, with indistinct purplish reflections and sparsely punctured, about three-fourths as long as the first joint of flagel; flagel reddish to fuscous at apex, first joint distinctly longer than second, second same length as third; pronotum purplish and somewhat indistinctly, coarsely striated; mesonotum purplish, shining, sparsely punctured except a medial area running back from anterior margin, which is closely punctured and bronzy purplish colored; parapsidal grooves and suture on apical margin bronzy purplish colored; mesopleuræ purplish with bronzy purplish reflections and coarsely rugose; a small smooth, shining area with a few punctures at base of pleuræ just above the sternauli; scutellar fovea bronzy purplish colored; scutel purple, smooth and shining with a few punctures; metanotum coarsely rugose, purplish with bronzy purplish reflections; propodeum coarsely rugose, bronzy purplish with greenish bronze reflections; all coxæ purplish with bronzy purplish reflections; anterior and middle femora, tibiæ, and trochanters bluish with purplish reflections.

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[1] Proc. U. S. Nat. Mus., vol. 44, p. 469.

Tarsi reddish; claws fuscous; hind femora dark reddish with bronzy purplish reflections, darker inside than outside especially toward the apex and base where it is nearly black; tibiæ and spurs reddish; tarsi and claws black except fourth joint which is whitish; first abdominal segment and base of second purplish, remainder of second and all of third violaceous; remainder of abdomen white; claspers black; wings dark fuscous with violaceous reflections; petiole smooth and polished, remainder of abdomen finely shagreened.

Paratype with purplish and bluish reflections; apex of third joint of hind tarsi as well as fourth segment white; hind femora uniformly reddish, two small white spots on vertex are replaced by a white band.

# A NEW PEARLY FRESHWATER MUSSEL OF THE GENUS HYRIA FROM BRAZIL.

By L. S. Frierson,
*Of Frierson, Louisiana.*

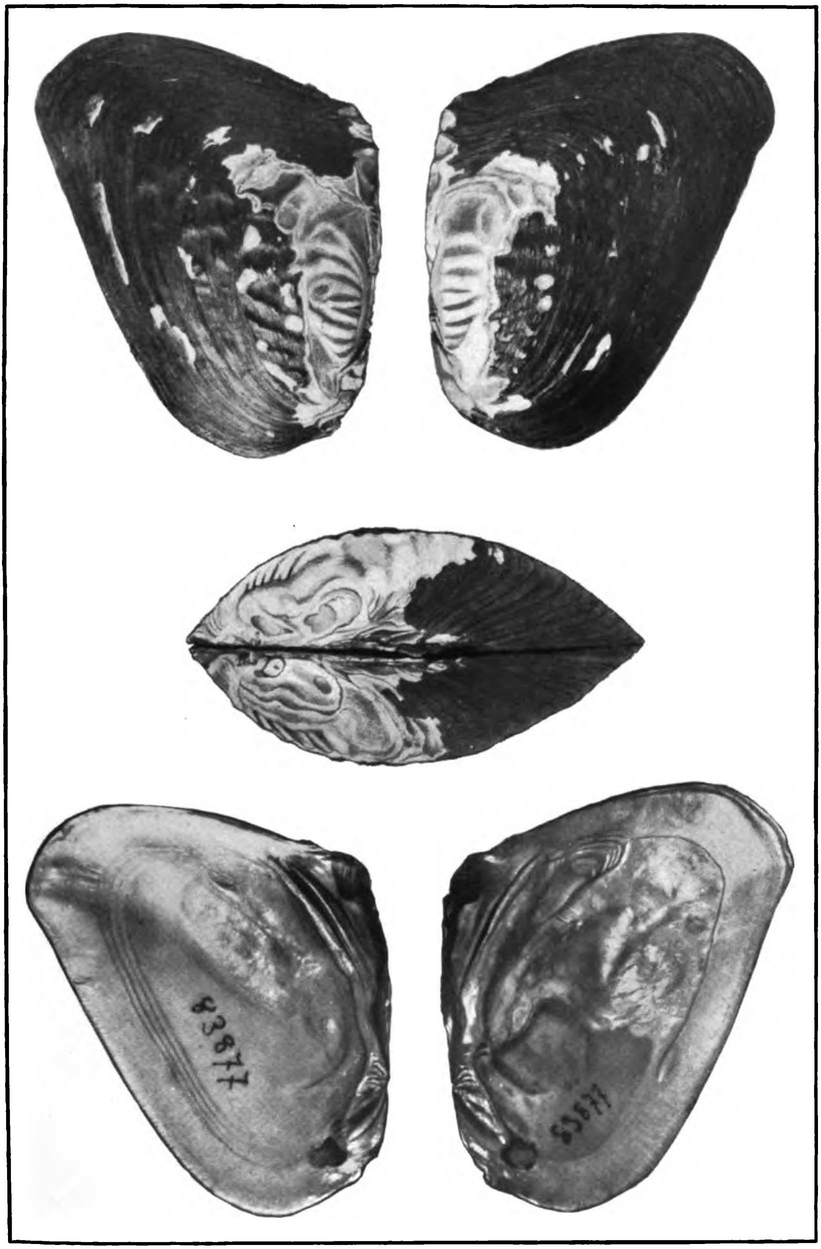
While looking over the Lea collection in the United States National Museum the shell to be described below was noted, the label attached to it being "*Hyria corrugata*, from the Amazon River, Brazil, from Captain Brown." It differs so much from that species indeed as to be only placed in *Hyria* on account of the radial beak sculpture, and epidermis. The shell resembles, perhaps, the *Prisodon brownianus* Lea more than it does the ordinary Hyrias, but that shell is smooth, and the teeth differ considerably. The shell is decidedly novel, and really appears to be a connecting link between the genera *Hyria* and *Diplodon*. (It is not impossible that this species may be the "*Hyria humilis* Troschel," unpublished so far as I am aware, a species said to be from Guiana, and referred to by Wiegmann in 1847, the name being suggestive.)

### HYRIA AMAZONIA, new species.

Plate 12.

Shell small, solid, triangular, inflated. Length, 4; height, 2.7; diameter, 2 cm., narrow in front, and almost square with the base, which is straight almost to the posterior end, where there is a hint at a sulcus. The dorsum is nearly straight, rising into a slight wing, which in the type-specimen is just behind the middle. The posterior end descends rapidly to the rounded posterior point. The beaks are heavily radiately corrugated, breaking up in the center of the shell into pustulations, and becoming smooth next to the margin. Epidermis dull reddish brown, without other markings. The cavity of the shell is tray shaped, beak cavities very shallow. In the left valve there are two laterals, short, and remote from the cardinals, of which there is one low, compressed, and nearly vertical, in front, and a hint of another just beneath the beak. In the right valve there is one lateral and one low ragged split-up cardinal. The protractor-pedis scar is either absent or placed above the adductor scar, and is very small, confluent behind. Nacre white and purplish (somewhat diseased in the center of the type-specimen).

*Type.*—Cat. No. 83877, U.S.N.M.



HYRIA AMAZONIA FRIERSON.

FOR EXPLANATION OF PLATE SEE PAGE 363.

# DESCRIPTIONS OF NEW SPECIES AND GENERA OF LEPIDOPTERA FROM MEXICO.

By HARRISON G. DYAR,
*Custodian of Lepidoptera, United States National Museum.*

This is the fourth paper[1] dealing with new Lepidoptera from Mexico which have recently been incorporated in the collections of the National Museum. The material was received almost entirely from Mr. William Schaus and Mr. Roberto Müller.

The present paper comprises descriptions of 135 new species, 1 new subspecies, 20 new genera, and references to the synonymy of 7 previously known species.

## Family AGAPETIDAE.

### Genus EUPTYCHIA Hübner.

**EUPTYCHIA SUIVALENS, new species.**

Dark brown with slight ocherous tint; fore wing unmarked in the male, with two reddish bands and a bent discal mark close to subcostal in the female. Hind wing of male with two or three black shaded submarginal spots, of the female with the spots more distinct and an irregularly angled and dentate median line, not attaining the margin and followed by a light shade. Below the fore wing with two reddish bands and discal mark as in the female above; also a crenulate submarginal line, beyond which the ground color is deep brown. Hind wing deep brown with two red-brown lines; the inner angled on vein 5 and median vein, the outer doubled, yellowish filled, angled on subcostal and the yellow spreading out to apex, squarely dislocated on veins 2–4; beyond it a light purplish area; a submarginal silver line forming two loops at veins 1–3, followed by two oval ocelli, black, yellow ringed, with double, outwardly eccentric silver arcs, then two elongate pure silver spots without edges or pupils, situated in the interspaces of veins 5–7. Expanse, 37–40 mm.

*Type.*—Male, No. 16476, U.S.N.M.; San Buena Ventura, Puebla, Mexico, May, 1913 (R. Müller). Also four males and one female, Jalapa, Mexico (Schaus collection).

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[1] The preceding papers were published as follows:
No. 1742, Proceedings United States National Museum, vol. 38, pp. 229–273, June 7, 1910.
No. 1885, Proceedings United States National Museum, vol. 42, pp. 39–106, Mar. 6, 1912.
No. 1951, Proceedings United States National Museum, vol. 44, pp. 279–324, Feb. 11, 1913.

## Family RIODINIDAE.

### Genus ANCYLURIS Hübner.

**ANCYLURIS INCA MORA, new subspecies.**

*Female.*—Band of fore wing narrower than in *inca* Saunders and terminating at vein 2; spot on costa of hind wing smaller and shorter.

*Males.*—Band of fore wing oblique, reaching tornus. Hind wing with no yellow above; beneath with a small white spot near tornus and a larger orange one above it.

*Cotypes.*—Male and female, No. 16441, U.S.N.M.; Santa Rosa, Vera Cruz, Mexico, August, 1906 (W. Schaus).

## Family HESPERIIDAE.

### Genus MYSCELUS Hübner.

**MYSCELUS PERISSODORA, new species.**

Dark red-brown, scarcely bronzy; fore wing with the costa shaded with black over cell, the veins black; three large hyaline spots across middle of wing, a quadrate one in cell, somewhat larger rectangular one below vein 3 and a triangular one below vein 2; a subapical row of hyaline spots, five in a curved row, the upper three wedge-shaped, progressively larger, then a small one, then a narrow one; two spots below, the upper notched, the lower rounded, separated by vein 4. Hind wing red-brown with central dusky shaded band. Beneath the fore wing is blackish, the spots repeated, the base light yellow nearly to the band of spots. Hind wing black, the basal half pale yellow, cut by a black bar on inner margin and followed by some scattered yellow scales. Palpi beneath, pectus, legs and base of abdomen pale yellow. Expanse, 52 mm.

*Type.*—No. 15454, U.S.N.M.; Misantla, Mexico, June, 1912 (R. Müller).

### Genus PARATRYTONE Godman.

**PARATRYTONE APHRACTOIA, new species.**

Brown-black; fore wing with an oblique quadrate yellow-hyaline spot in the end of the cell, three small ones beyond, closely continuous in line, a narrow one above vein 1, large one above vein 2 and small one above vein 3, there in an oblique line; male brand oblique from vein 1 to 3, black, surrounded by a black area. Hind wing with four yellow spots in a straight row between veins 1b and 5, alternatingly large and small. Beneath, fore wing with the markings repeated, the lower spot elongated and white; a black shade in disk. Hind wing dark red shaded, the spots repeated in white and in addition three others, one in cell, two on costa, these small. Expanse, 32 mm.

*Type.*—Male, No. 16442, U.S.N.M.; Popocatopetl Park, 13,000 feet, Mexico (W. Schaus).

### Genus OCHLODES Scudder.

#### OCHLODES SAMENTA, new species.

Black-brown, a little bronzy shaded; male brand black, oblique, from vein 1 to 3; three spots beyond it, the one above vein 1 narrow, above 2 transverse, both yellow, the one above vein 3 quadrate, partly hyaline; three minute hyaline costo-subapical spots. Hind wing with a band of three joined fulvous spots across the disk between veins 2 and 7 or a little beyond. Beneath, fore wing with the spots repeated, enlarged, the lower cuneiform and fulvous; disk black. Hind wing brown, the band repeated in carneous gray, running from 1b to costa with projections on the outer side and a smaller straight band across subbasally, followed by a dark shade. Expanse, 30 mm.

*Cotypes.*—Three males, No. 16443, U.S.N.M.; Sierra de Guerreo, Mexico, May, 1911, and December, 1912 (R. Müller); Guadalajara, Mexico (W. Schaus).

### Genus THORYBES Scudder.

#### THORYBES UVYDIXA, new species.

Dark brown, overspread with light chocolate over two-thirds of fore wing and all but margins of hind wing. Fore wing with yellowish white spots, forming a straight line from middle of costa toward tornus, two minute subcostal, a constricted broken hour-glass shaped one in cell, emarginate larger one above vein 2 and small one below it; a narrow spot beyond the line above vein 3 and a partly obsolete curved row of five subapically; fringe checkered black and pale. Beneath fore wing black on the disk, yellowish below vein 2; spots repeated in white, enlarged, the apex powdered with white and showing a submarginal row of white powdery lunules; hind wing black, white powdered, heavier outwardly, the outer half nearly solidly milky, relieving two narrow, very irregular mesial black lines, of which the inner is connected with three rounded gray areas and another of these areas is situated below costa before the middle. Fringe dark with a black basal line, slightly checkered. Expanse, 48 mm.

*Type.*—No. 18191, U.S.N.M.; Sierra de Guerrero, Mexico, June, 1913 (R. Müller).

### Genus PHOLISORA Scudder.

#### PHOLISORA SMODORA, new species.

Deep black; head touched with greenish yellow, collar golden behind; fore wing with an outer row of nine small elongate white spots across the wing, strongly excurved over cell; no other marking. Below deep black, a little shining, unicolorous, the veins not contrasted. Palpi beneath, pectus and venter of abdomen white. Expanse, 27 mm.

*Type.*—Male, No. 18192, U.S.N.M.; Sierra de Guerrero, Mexico, June, 1913 (R. Müller).

## Family LITHOSIIDAE.

### NUDUR, new genus.

Fore wing with 10 veins, 3 from before angle of cell, 4, 5 from cross vein, 6 from apex of cell, 7 to 10 coincident, 11 free. Hind wing with 3 from close to angle of cell, 5 from center of cross vein, 6 and 7 coincident, 8 from beyond middle of cell. Hind tibia with 4 small spurs; palpi slender, porrect; tongue well developed.

*Type of the genus.*—*Nudur fractivittarum*, new species.

#### NUDUR FRACTIVITTARUM, new species.

Fore wing ocher yellow, stained with red around the markings; markings dark slate color; a straight band from base to middle of outer margin, starting from a small basal costal mark; a short band at base on inner margin and another before tornus; two oblique bands on costa, starting as straight costal dots, then abruptly swept outward at inner and outer thirds, respectively. Hind wing dark rosy with small dark rounded patch at apex. Expanse, 18 mm.

*Type.*—Male, No. 15455, U.S.N.M., Misantla, Mexico, May, 1912 (R. Müller).

### Genus AFRIDA Möschler.

#### AFRIDA COAGULATA, new species.

Fore wing silvery white; a purplish brown, black-edged patch on costa at base; a large quadrate one on middle of costa; a large one on outer margin extending inward centrally; six broken, angular, black lines arising from inner margin to cell; two dots on costa before apex. Hind wing whitish, stained with gray, especially in discal dot and margin. Expanse, 18–21 mm.

*Cotypes.*—Male and female, No. 15456, U.S.N.M.; Tehuacan, Mexico, September, 1908 (R. Müller); Oaxaca, Mexico (Schaus collection).

#### AFRIDA ZOEPHILA, new species.

Fore wing silvery white; no basal dark patch, the costal area a little luteous stained within the irregular broken black inner line; central costal patch rounded below, purple brown, black outlined; marginal patch large, extending inward centrally, edged with black dots and dashes; two angular lines below cell, diverging on vein 1, the space between them luteous stained. Hind wing smoky fuscous throughout. Expanse, 15 mm.

*Cotypes.*—Male and female, No. 15457, U.S.N.M.; Orizaba, Mexico, July, 1910 (R. Müller); Juan Vinas, Costa Rica (W. Schaus).

#### AFRIDA ZOLDA, new species.

Fore wing silvery white, without basal or costal dark patches; marginal patch large, produced inward centrally; inner line irregular, angled and broken; outer line sharply angled subcostally, then nearly even and close to marginal patch, broken below; two dashes on costa before apex, forming a broken arc; some dots and dashes in upper edge of the marginal patch. Hind wing fuscous shaded, darker on the apex. Expanse, 18 mm.

*Type.*—Female, No. 15458, U.S.N.M.; Oaxaca, Mexico (Schaus collection).

## Family ARCTIIDAE.

### Genus HYALARCTIA Hampson.

**HYALARCTIA TEPICA, new species.**

Pale yellow, translucent, except along costa and inner margin of fore wing; veins of fore wing narrowly lined with black. Head and collar ocher, two small black points on collar and one on each patagium. Black lines on front side of fore and mid legs. Expanse, 39 mm.

*Type.*—Female, No. 16444, U.S.N.M.; Itapà, near Tepic, Mexico (R. Müller).

## Family NOCTUIDAE.

### Subfamily AGROTINAE.

### Genus AGROTIS Ochsenheimer.

**AGROTIS CHABAUDANA, new species.**

Collar black, with a yellow-white line in front, widening to the sides. Fore wing slaty gray with only a trace of brown, the costa broadly yellow clay color to before the outer line; a black wedge at base; cell filled in with black before and between the stigmata; orbicular and reniform large, of the ground color, defined by narrow pale lines, open below; inner line smooth, pale, incurved in an arc across submedian space; outer line smooth, pale, faintly dark edged, excurved from costa, subparallel to outer margin below; a pale terminal line. Hind wing pale at base, fuscous shaded outwardly, with dark discal spot and outer line. Expanse, 40 mm.

*Type.*—Female, No. 16477, U.S.N.M.; Zacualpan, Mexico, June, 1913 (R. Müller).

Named in honor of Mr. Roberto Müller's correspondent in Zacualpan, State of Mexico, near the frontier of Guerrero, Mr. Alfredo Chabaud.

**AGROTIS DELICATESSA, new species.**

Collar black beyond base. Fore wing brown, the color clear in basal space and beyond outer line, shaded with blackish centrally; costa grayish clay-color to outer line; a black wedge at base; cell filled with black before and between the stigmata; orbicular creamy brown, rounded below, open above and joined to a narrow line below costal stripe running to base; claviform black-outlined, pale brown filled; reniform brown with pale edge within and narrow black one without; inner line smooth, blackish, double, incurved across submedian space; outer line black, denticulate, faintly doubled, excurved a little over veins 2–5; subterminal line pale, flexuous, with a blackish mark on the costa. Hind wing whitish, shaded with gray on veins and costa; a round discal dot and traces of outer line. Expanse, 33 mm.

*Type.*—Male, No. 16478, U.S.N.M.; Zacualpan, Mexico, May, 1913 (R. Müller).

### Genus UFEUS Grote.

#### UFEUS LURA, new species.

Dark violaceous brown, finely blackish irrorate, the space beyond the outer line a little paler; veins and lines black; inner line distinct only below the cell, pale-edged inwardly, forming a strong angle outward on submedian fold and a sharp one inward on vein 1; outer line pointed on the veins, followed by pale, bent at right angles just below costa and parallel to it for a short distance, then roundedly excurved and becoming parallel to outer margin. Hind wing uniform smoky fuscous. Expanse, 38 mm.

*Type.*—Male, No. 16479, U.S.N.M.; Mexico City, Mexico, June, 1913 (R. Müller).

### Genus TIMORA Walker.

#### TIMORA TESSIPTA, new species.

Pale yellow; head and part of thorax tinged with pink; fore wing pale yellow, a broad subterminal band of pink from apex to tornus, curving a little and leaving a rather wide terminal space of the yellow ground color; a short band at base along submedian fold, and a narrower one in lower part of cell. Hind wing blackish, paler at base and costa. Expanse, 20 mm.

*Type.*—Male; No. 18193, U.S.N.M.; Tehaucan, Mexico, September, 1913 (R. Müller).

## Subfamily HADENINAE.

### Genus MISELIA Hübner.

#### MISELIA VERRUCA, new species.

Fore wing blackish gray; a black dash at base, cutting the black subbasal half line; inner line black, partly relieved by white borders, forming three arcs; claviform black, pointed, touching the outer line; orbicular minute, circular; reniform white, with black central mark; outer line obsolete above, lightened by white borders below; a row of black dashes along costa; subterminal line white, wavy, powdery; an oblique black dash above tornus. Hind wing whitish, shaded with fuscous along the veins outwardly and on margin. Expanse, 22 mm.

*Type.*—Female, No. 15461, U.S.N.M.; Tehuacan, Mexico, September, 1912 (R. Müller).

### MISELIA CENTROCHLORA, new species.

Fore wing light gray tinged with violaceous; median space shaded with dark olive, fully below the cell, between the stigmata through the cell to costa; claviform covered by a blackish shade; basal field nearly clear of markings; orbicular and reniform annular, the orbicular of the ground color, the reniform with a concentric olive ring; inner line black, slender, arcuate; outer line excurved over cell in a sharp point, running nearly to the subterminal line; subterminal line pale with dusky edge, flexuous, faint; margin stained with olive. Hind wing sordid whitish, the margin broadly fuscous. Expanse, 26 to 29 mm.

In the female the central dark olive shade is absent, showing an elliptical black-edged claviform; submarginal space violaceous shaded. Expanse, 32 mm.

*Cotypes.*—Two males, one female, No. 15462, U.S.N.M.; Misantla, Mexico, December, 1911, January, 1912 (R. Müller).

## Genus ERIOPYGA Guenée.

### ERIOPYGA ECCARSIA, new species.

Fore wing black, shining, the only marking visible being the large, distinct reniform, which is oblique, narrow, white, annular, with a slight indentation on the outer side; some small white specks on costa toward apex. Hind wing whitish at the base, shaded with blackish over apex and outwardly. Expanse, 26 mm.

*Type.*—Female, No. 16446, U.S.N.M.; Zacualpan, Mexico, August, 1909 (R. Müller).

### ERIOPYGA MONOPIS, new species.

All blackish, the only distinct marking being the upright oval white reniform; other marks very faint; orbicular somewhat more leaden than the ground; outer and subterminal lines traceable, dark, even, and parallel to outer margin. Hind wing fuscous, lighter over the disk to base, showing a dark discal spot. Expanse, 31 mm.

*Type.*—Male, No. 16481, U.S.N.M.; Zacualpan, Mexico, June, 1913 (R. Müller).

### ERIOPYGA STICTIPENNA, new species.

Antennæ of male pectinated; dark brown, with white dots along costa and outer line, giving a dotted appearance; reniform white, broken; other lines inconspicuous, inner and outer double, paler-filled, wavy, subterminal pale, forming two arcs; claviform and orbicular outlined in black, rounded. Hind wing with dark dot in end of cell, pale over disk, veins and margin fuscous, fringe white. Expanse, 25 mm.

*Type.*—Male, No. 16447, U.S.N.M.; Tehuacan, Mexico, September, 1910 (R. Müller).

### ERIOPYGA DIPLOPIS, new species.

Thorax blackish, collar rusty brown. Fore wing blackish, the lines obsolete; reniform distinct, white, with a rusty yellow broad inner edge; orbicular large, black-edged, somewhat oblique, filled with the ground color; an irregular shaded and dentate black subterminal line from costa, then obsolete. Some black between the stigmata in the female, none in the male. Hind wing whitish through the center, costa fuscous, darker in the female than in the male. Expanse, male, 28 mm.; female, 27 mm.

*Cotypes.*—Male and female, No 16480, U.S.N.M.; Zacualpan, Mexico, June and July, 1913 (R. Müller).

### ERIOPYGA XERA, new species.

Blackish brown, uniform; markings obscure, the lines black, somewhat thick, the inner a little oblique and broken-segmented; outer line excurved over cell, a little angled and dentated by obscure following points; orbicular a dot; reniform pale ringed; subterminal line with thickened black inner edge followed by pale, nearly straight and subparallel to margin. Hind wing fuscous brown, a little lighter in the cell, relieving a dark discal spot. Expanse, 23–24 mm.

*Cotypes.*—Two females, No. 16482, U.S.N.M.; Zacualpan, Mexico, June and July, 1913 (R. Müller).

The markings are described from the June specimen; in the July one nothing can be made out but the subterminal line, and that is obscure.

### ERIOPYGA BORTHORODES, new species.

Dark brown, the markings obscure; lines blackish, crenulate, the inner line edged within, the outer without by pale, somewhat spotted; inner line oblique; outer line excurved over cell; orbicular and reniform pale-edged, dark ringed or filled, a dark spot in lower segment of reniform; subterminal line pale, even, rather broad, with an inward dent subcostally, distinct, the terminal space beyond it slightly paler than the ground. Hind wing fuscous, lighter over the cell, with or without a dark discal spot. Expanse, 26 mm.

*Cotypes.*—Two females, No. 16483, U.S.N.M.; Zacualpan, Mexico, June, 1913 (R. Müller).

## Genus HYDROECIODES Hampson.

### HYDROECIODES RECTILINEA, new species.

Fore wing light purple, shading to dark bronze on outer margin, where this color forms a large patch; inner markings obsolete; outer line distinct, straight, white, oblique with a narrow dark inner edge. Hind wing whitish, tinged with purplish gray outwardly. Expanse, 29 mm.

*Type.*—Male, No. 16448, U.S.N.M.; Mexico City, Mexico (R. Müller).

## Genus HYSSIA Guenée.

### HYSSIA DEGENERANS, new species.

Light reddish brown; a large area over the end of cell, narrowing basally, blackish; lines indistinct, showing as irregular transverse streaks, the outer continuous and curved, somewhat dotted; terminal space moderately and evenly a shade paler, without evident subterminal line. Hind wing pale ocherous whitish, shaded with fuscous broadly over apex; veins and discal dot gray; terminal line dark, broken. Expanse, 24 mm.

*Type.*—Male, No. 16484, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

### HYSSIA PLENIPOTENTIA, new species.

Fore wing dark brown, shaded with blackish; a black dash at base on submedian; inner line double, black, paler filled, forming an arc from media to vein 1 and from 1 to margin; claviform a broad black arc; orbicular a black circle; reniform full, black-edged, filled by ground color with a faint concentric ring and outer white edge; outer line double, with pale brownish filling, the outer edge very indistinct, inner edge dentate, the line sharply excurved beyond cell; subterminal line flexuous, pale brownish, preceded by indistinct black dashes, the narrow following terminal space black-shaded. Hind wing whitish in the male with fuscous border, veins and discal dot, largely fuscous in the female. Expanse, male, 30 mm.; female, 25 mm.

*Cotypes.*—Male and female, No. 16485, U.S.N.M.; Zacualpan, Mexico, June, 1913 (R. Müller).

## NEOMANOBIA, new genus.

Proboscis fully developed; palpi upturned, the second joint thickly scaly, the third smooth; front smooth, rounded; antennæ of male ciliate; eyes large, rounded; head and thorax clothed with hair and hair-like scales; pro- and meta-thorax with spreading crests; fore tarsi with a row of stout spines on the outer side of first joint; abdomen without crests.

*Type of the genus.*—*Neomanobia thyodes*, new species.

### NEOMANOBIA THYODES, new species.

Fore wing dark brown-black, the reniform discolorous, red-brown, with narrow clay-colored outer edge; other stigmata absolete; lines black, thickened, crenulate, subsegmented, obscure; inner line oblique; a coarsely angled median black line without bordering pale scales, touching the reniform inwardly; outer line projected over reniform, doubled centrally by a row of remote black dots; subterminal line rather distinct, black, indented subcostally and submedially. Hind wing brown, shaded with blackish on outer third; veins and small discal spot black. Expanse, 33 mm.

*Type*.—Male, No. 16486, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

### Subfamily CUCULLIINAE.

### Genus HOMONCOCNEMIS Hampson.

#### HOMONCOCNEMIS PSAPHIDOIDES, new species.

Fore wing brownish gray; subterminal line white, coarsely and finely wavy, near the margin; a black dash on submedian fold at base and termen, edged with blackish shades, cutting the subterminal line; a blackish shade across median space and between the stigmata; inner line black, sharply angled on the veins and folds, double; orbicular large, round, pale, in a black ring, broken above and below; reniform less pale, large, with black central arc; outer line black, denticulate, curved over cell, oblique below; black streaks on the veins in subterminal space; fringe spotted black and white. Hind wing white; a terminal fuscous line, enlarged at submedian fold. Expanse, 35 mm.

*Type*.—Male, No. 16487, U.S.N.M.; Zacualpan, Mexico, June, 1913 (R. Müller).

### Subfamily ACRONYCTINAE.

### Genus LUPERINA Boisduval.

#### LUPERINA CUPPES, new species.

Bronzy brown, darker in median space, the submarginal space light at base; lines brown, double, paler, somewhat violaceous filled; inner line coarsely waved; outer line excurved over cell and with black points on veins 3 and 4; orbicular and reniform large, slightly paler than the median ground and filled with violaceous like the lines; subterminal line bronzy, denticulate; terminal space dark. Hind wing brown, with central dark band and narrow terminal line; fringe of both wings dark with basal light line. Expanse, 31 mm.

*Type*.—Male, No. 16488, U.S.N.M., Zacualpan, Mexico, July, 1913 (R. Müller).

### Genus NOCLOA Smith.

#### NOCLOA EZEHA, new species.

Fore wing comparatively broad and short; pale yellow; a little irrorated with orange; a square purple patch in the cell between the obsolete stigmata; outer line slender, dentate and excurved above, preceded by three purplish patches, two in the excurve opposite cell, one on submedian fold; a row of triangular purplish patches between the veins subterminally. Hind wing pale ocher. Expanse, 24 mm.

*Type*.—Male, No. 18194, U.S.N.M.; Sierra de Guerrero, Mexico, July, 1913 (R. Müller).

## Genus ANTAPLAGA Grote.

### ANTAPLAGA PREPONTENDYTA, new species.

Head, thorax, and fore wing white; inner and outer lines slender, black, approximate, the space between them filled in with orange ocher, including the approximated stigmata; inner line tremulous; outer line angled at veins 3 and 6; faint mesial line excurved in cell; orbicular white; reniform narrow, white, black centered and black edged; terminal space tinged with orange at margin, the veins black lined, with illy-developed intravenular streaks also. Hind wing blackish, the termen orange tinted. Expanse, 28–30 mm.

*Cotypes.*—Two males, No. 18195, U.S.N.M.; Sierra de Guerrero, Mexico, July, 1913 (R. Müller).

## CALOCEA, new genus.

Eyes large, round; tongue fully developed; fore wing with areole; fore legs unarmed; frons with large prominence, densely roughened; abdomen without crests; prothorax with divided crest; metathorax with crest; palpi upturned, reaching vertex of head.

*Type of the genus.*—*Calocea eucraspedica*, new species.

### CALOCEA EUCRASPEDICA, new species.

Basal space of fore wing and costa centrally light tan-brown; median space light bronzy brown; distal dot light tan-brown; lines brown, faint; inner line excurved, reaching to origin of vein 2; outer line far out, strongly excurved, approaching the margin centrally, double; terminal space pink, with a darker rosy triangle on costa beyond outer line. Hind wing dull brown, the margin shaded with sordid rosy. Expanse, 28 mm.

*Type.*—Male, No. 15459, U.S.N.M.; Tehuacan, Mexico, July, 1912 (R. Müller).

## Genus STIRIA Grote.

### STIRIA TACHYMORA, new species.

Thorax purple brown; collar and vertex yellow; fore wing olive grayish on basal three-fourths, then narrowly yellow, the margin shaded with red-brown, the fringe dark purple brown; a broad, clouded brown-black band across middle of wing. Hind wing white, a little sordid, but without any marginal staining. Expanse, 36 mm.

*Type.*—Male, No. 14444, U.S.N.M.; Mexico City, Mexico, September, 1912 (R. Müller).

### STIRIA ITICYS, new species.

Head and collar pale yellow; disk of thorax dark brown. Fore wing pale yellow with a broad brown shade along inner margin from base to outer line, lightened in two oval patches beyond the inner line; lines brown, slender, rather faint; inner line angled on submedian fold; outer line angled between veins 6 and 7 and running out in a point nearly to outer margin; orbicular and reniform large slender rings. Hind wing whitish, or a little shaded with fuscous. Expanse, 24–25 mm.

*Cotypes.*—Two males, No. 18196, U.S.N.M.; Zacualpan, Mexico, September, 1913 (R. Müller).

### STIRIA ARGYROPOLIA, new species.

Head and thorax ocher-whitish, shading to blackish gray posteriorly. Fore wing silver-gray; lines olive brown edged with pale yellow away from the center; inner line angled on submedian fold; outer line starting from near center of inner margin straight toward apex below vein 6, where it is sharply bent, running straight inward, then curved to costa; fringe mixed with brown. Hind wing ocher whitish. Expanse, 32 mm.

*Type.*—Male, No. 16489, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

## Genus STIRIODES Hampson.

### STIRIODES NYDAR, new species.

Dark olive brown; fore wing with traces of inner and outer dark lines, smooth, strongly excurved; subterminal line shown as a dark patch on costa; terminal areas paler. Hind wing fuscous, yellowish toward base and fringe yellow; a small dark discal spot. Expanse, 22 mm.

*Type.*—Male, No. 16490, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

Like *S. umbria* Druce, larger, hind wing paler, the lines of fore wing less distinct, more curved, the median not as distinct as the others.

### STIRIODES SUBSERVIENS, new species.

Wings longer; body more robust than usual. Ocherous yellow, color of *S. procida* Druce, marked with brown; inner and outer lines brown, shaded, diffused, the inner curved, the outer incurved below; a broad diffused shade spreading over most of median space, but not completely continuous; orbicular and reniform indicated; a brown costo-subapical spot. Hind wing fuscous, the fringe yellow. Expanse, 22 mm.

*Type.*—Female, No. 16491, U.S.N.M.; Orizaba, Mexico (Schaus collection).

## CACOFOTA, new genus.

Tongue well developed; palpi upturned to near middle of front; front with low rounded prominence, transversely cut below by a deep groove, below which is a large plate; eyes large, rounded, smooth; tibiæ unarmed. Hind wing with vein 5 weak, from near middle of cross vein.

*Type of the genus.*—*Cacofota inermis*, new species.

#### CACOPOTA INERMIS, new species.

Fore wing long, pointed at apex; smooth gray; inner line black, from costa to vein 1, angled subcostally and submedially, faintly doubled centrally; orbicular and reniform large, similar, discolorous red-brown with paler edge in a black ring, the orbicular oblique; outer line represented by a few scattered spots; subterminal line a faint pale shade; a long black streak on vein 8; terminal dots small. Hind wing creamy whitish. Expanse, 31 mm.

*Type.*—Male, No. 16492, U.S.N.M.; Zacualpan, Mexico, June, 1913 (R. Müller).

### Genus SPHIDA Grote.

#### SPHIDA PLEOSTIGMA, new species.

Fore wing reddish brown with chocolate shadings; a light pinkish angular area at base, running out along costa; orbicular and reniform dull red-brown filled, the former narrow, longitudinal, the latter full, obliquely cut below, a point on upper corner, the costal edge not well defined; median vein and branches dark; a dark faint extra-mesial shade line; outer line slender, scalloped between the veins; terminal space purplish gray, with darker subsagittate marks on the veins. Hind wing, brown, fuscous broadly on margin. Expanse, 52 mm.

*Type.*—Female, No. 15460, U.S.N.M.; Teapa, Tabasco, Mexico. September, 1912 (R. Müller).

### Genus TRACHEA Ochsenheimer.

#### TRACHEA STYGIA, new species.

Deep brown-black; ordinary marks indistinct, except the reniform, which is rather conspicuously pale-bordered outwardly; lines crenulate, the outer with a duplication touching the ends of the cusps; claviform joined to the outer line by a bar on submedian fold; orbicular circular with a central dot; reniform large, deeply concave outwardly, slightly paler than the wing, black-edged, with a pale reddish inner border on the outer side; median line shown on costa and forming an arc in cell; three white dots on costa before apex; subterminal line very faint, followed by scattered whitish scales; a slender crenulate terminal line. Hind wing white, stained with blackish on the veins and broadly so on the outer margin. Expanse, 40 mm.

*Type.*—Male, No. 16445, U.S.N.M.; Mexico City, Mexico, July, 1911 (R. Müller).

## Subfamily ERASTRIINAE.

### GORGORA, new genus.

Fore wing with accessory cell, vein 7 from its end, 8, 9 stalked, 10 from upper side. Fore tibia with claw on outer side; front with large, roughened, coarsely granular area; palpi short, reaching frons, coarsely clothed.

*Type of the genus.*—*Gorgora morga*, new species.

### GORGORA MORGA, new species.

Black; thorax dorsally, palpi and hairs on femora orange. Fore wing shining greenish black, the marks edged with dull black; a large round orange discal spot; a marginal orange band, dentate outwardly, touching termen by its dentations on the veins, the fringe black. Hind wing black, with only a little metallic gloss. Expanse, 34 mm.

*Type.*—Female, No. 15463, U.S.N.M.; Mexico City, Mexico, September, 1912 (R. Müller).

## Genus TROGOBLEMMA Hampson.

### TROGOBLEMMA CACODOXICA, new species.

Fore wing with the outer margin excavate in its upper half, leaving a projection at middle; red-brown, irrorate with purplish and a little red; markings illy defined. A small black discal dot. Hind wing light fuscous. Expanse, 15–20 mm.

*Cotypes.*—Three females, No. 15464, U.S.N.M.; Orizaba, Mexico (Schaus collection); Juan Vinas, Costa Rica, November, 1909 (W. Schaus).

Very close to *T. modesta* Schaus, described from Costa Rica, but which I have also from Jalapa, Mexico. In the female of *modesta* the hind wings are pale with a curved extra-discal gray band, which beneath is strongly arcuate and submacular. In *cacodoxica,* the hind wings of the female are entirely fuscous shaded, the band beneath shaded, obscure and only slightly arcuate. Mr. Schaus's Costa Rican specimen was identified by him as the female of *modesta.*

Hampson's description of the genus is in error in the statement "Proboscis absent." It is true that in the type-specimen of *T. acutalis* Schaus the tongue is absent, but it has been broken off, and is plainly visible in other specimens before me from the same locality. The large discal spot of the type is a variation only, the other specimens showing minute discal dot or replaced by a large white patch. A similar variation occurs in *T. modesta.*

## Genus PARANGITIA Hampson.

### PARANGITIA MOSAICA, new species.

Olivaceous brown, heavily shaded over a light clay color, that appears only about anal angle; claviform, orbicular, and reniform, round, light-ringed, forming a close group of similar spots; lines slender, black, dentate, not contrasted, the outer excurved over cell; an oblique white mark across apex, dentate outwardly; submarginal line wavy, defining a mottled darker terminal area. Hind wing blackish, a little bronzy, darker on the margin. Expanse, 21 mm.

*Type.*—Male, No. 15465, U.S.N.M.; Orizaba, Mexico (Schaus collection).

#### PARANGITIA CENTROCHALCA, new species.

Fore wing brown with metallic bronzy reflection, especially on median area; base somewhat darker, limited by the inner line, which is black, slender, dentate on subcosta and vein 1; discal marks pale-ringed, similar, in a group of three, the reniform a little constricted; outer line blackish, obscure, excurved over cell; subterminal line pale, waved, preceded by dark dashes subapically and followed by a darker terminal space. Hind wing black, a little bronzy. Expanse, 26 mm.

*Type.*—Female, No. 15466, U.S.N.M.; Jalapa, Mexico (Schaus collection).

### Genus ORUZA Walker.

#### ORUZA COSTALIS, new species.

Fore wing gray with a reddish tint; a straight, broad, sordid creamy white stripe, not quite touching costa; lines straight, slender, whitish; median space blackish shaded, with a blackish discal mark; subterminal line whitish, curved from costa to middle of outer margin, sharply dentate below. Hind wing colored like fore wing, with blackish discal dot, white extra-mesial line and zigzag submarginal one. Expanse, 16 to 23 mm.

*Cotypes.*—One male, two females, No. 15467, U.S.N.M.; Misantla, Mexico, June, 1912 (R. Müller); Orizaba, Mexico (Schaus collection).

Near to *O. albocostata* Druce, but the costa not so white and the zigzag subterminal line present.

#### ORUZA ALBOCOSTALIATA Packard.

*Acidalia albocostaliata* Packard, Hayden Rept. U. S. Geol. Surv. Terr., vol. 10, 1876, p. 336.

*Cosymbia albocostaliata* Hulst, Bull. 52, U. S. Nat. Mus., 1903, p. 292.

*Pleonectyptera albocostaliata* Dyar, Can. Ent., vol. 39, 1907, p. 209.

This North American species falls here. It has been placed among the Geometridæ until recently.

### Genus BRYOCODIA Hampson.

#### BRYOCODIA LILACINA, new species.

Yellowish gray at base, the lower part of median space dark lilacine; area beyond the outer line pale lilacine, contrasting; inner line black, waved, faint above; orbicular indicated; a black wedge before the reniform, which is elliptical, pale-filled; outer line smooth, excurved over reniform; subterminal line dark, broken, broadly shaded on costa. Hind wing pale gray. Expanse, 17 to 19 mm.

*Cotypes.*—Male and female, No. 15468 U.S.N.M.; San José de Guaymas, Mexico, April, 1910 (L. O. Howard).

## Genus COBUBATHA Walker.

### COBUBATHA DAMOZELA, new species.

Fore wing dark silvery gray at base, a slender black subbasal line, indented subcostally; a nearly erect median blackish shaded line, bent on median vein; space beyond it dark, filled by many lines and shades; reniform white, elliptical, cut outwardly by a black central patch; six coppery and whitish alternating lines close beyond it, outwardly oblique above, confused below, followed by a black submarginal patch centrally and a large dark apical truncate triangle; a slender black marginal line, preceded by white. Hind wing dark fuscous, with slight coppery reflection. Expanse, 15 mm.

*Type.*—Female, No. 15469, U.S.N.M.; Tehuacan, Mexico, August, 1912 (R. Müller).

### COBUBATHA DREPTICA, new species.

Fore wing with the base broadly lilacine gray, nearly unmarked, the costa dark; terminal half of wing dark, blackish lilacine, indistinctly marked with black; an inner slightly curved bordering line and subapical patch, continued as a broken line below are most distinct. Hind wing blackish, with bronzy reflection. Expanse, 13 mm.

*Type.*—Male, No. 15470, U.S.N.M.; Tehuacan, Mexico, September, 1910 (R. Müller).

### COBUBATHA EUPROPTOPA, new species.

Fore wing with the basal third light coppery violaceous, bounded by a curved line; middle field blackish, coppery, covering the stigmata, which are hardly visible, bounded by the outer line, which forms a loop beyond cell; terminal area dark, not so dark and solid as the median area, with a black blotch submarginally below costa and a smaller one below near the middle. Hind wing black, with bronzy tint. Expanse, 11 to 12 mm.

*Cotypes.*—Two females, No. 15471, U.S.N.M.; Guadalajara and Jalapa, Mexico (Schaus collection).

### COBUBATHA MONADA, new species.

Fore wing with the basal half light coppery brown, with a dark shade on costa; outer half violaceous blackish, the dividing line black, shaded, erect; a black shaded subapical mark from costa is the only marking visible. Hind wing black, with bronzy reflection. Expanse, 12 mm.

*Type.*—Female, No. 15472, U.S.N.M.; Jalapa, Mexico (Schaus collection).

Resembles *dreptica*, described above, but darker, the pale basal area less contrasted, smaller, and bounded by a straight not curved line.

#### COBUBATHA MILLIDICE, new species.

Fore wing with the base broadly leaden gray, the rest cupreous blackish; inner line broad, waved, violaceous gray; outer line similar, not far out, strongly and narrowly excurved at cell; orbicular and reniform marked by leaden scales and black arcs, obscure; subterminal line violaceous gray with accumulations of black scales forming irregular spots centrally; some black streaks in the fringe below apex. Hind wing fuscous blackish. Expanse, 13 mm.

*Type.*—Male, No. 16493, U.S.N.M.; Tehuacan, Mexico, April, 1913 (R. Müller).

### Genus OZARBA Walker.

#### OZARBA SEMIPOTENTIA, new species.

Small; narrow-winged; fore wing dark brown, the reniform pale carneous, with a similar spot joined to costa, forming an oblique narrow bar with a blunt tooth outwardly, the reniform proper edged with deep black; a dark area beyond to apex, leaving the terminal space broadly pale, narrowing to apex; subterminal line obsolete; inner line faint, forming a double dash on costa; outer line from lower angle of reniform to inner margin, pale, dark-edged, straight. Hind wing pale fuscous, darker on the margin. Expanse, 13 mm.

*Type.*—Male, No. 16494, U.S.N.M.; Teapa, Tabasco, Mexico, April, 1913 (R. Müller).

#### OZARBA CHORUBA, new species.

Fore wing warm bronzy reddish, overspread with dark lilacine gray from base to outer line and from beyond this in a triangle to apex; inner line faintly indicated; reniform in a clear space, light, with a black arc within and dots without; outer space light, continuous with reniform area; subterminal line dark, vague, wavy. Hind wing dark brown, margin broadly darker; faint dark discal dot. Expanse, 20 mm.

*Type.*—Female, No. 10548, U.S.N.M.; Jalapa, Mexico (Schaus collection).

### Genus EUSTROTIA Hübner.

#### EUSTROTIA INVETERATA, new species.

Fore wing gray, with fine indistinct cross lines; an inner deep black band, broad, curved, rising from the inner margin to half across the cell, where it narrows and continues very slenderly to costa; termen very narrowly and fringe black, forming a point of the gray ground outward about vein 4; discal dot (reniform) a small trace; a faint dark cloud on costa subapically. Hind wing dark fuscous. Expanse, 18 mm.

*Type.*—Female, No. 16495, U.S.N.M.; Tehuacan, Mexico, July, 1913 (R. Müller).

### Genus FRUVA Grote.

**FRUVA VINCULIS, new species.**

Basal half of fore wing nearly black, shaded; apical half olivaceous, dusted with white scales; markings obsolete, except slight whitish flecks on costa before apex. Hind wing ocherous whitish, more or less shaded with gray, especially along margin. Fore wing below pale, with a broad black band through cell and fringe black. Expanse, 18–20 mm.

*Cotypes.*—Two females, No. 16496, U.S.N.M.; Tehuacan, Mexico, June, 1913, and August, 1912 (R. Müller).

## Subfamily EUTELIINAE.

### Genus EUTELIA Hübner.

**EUTELIA APITHANA, new species.**

Fore wing dark brown; inner line far out, whitish, slender, arcuate; a light space beyond in cell; reniform whitish outlined, lumate, followed by a large elliptical chocolate brown spot, with a slight point on its outer corner; outer line forming the outer border of this spot, whitish, slender, approaching the inner line below; beyond a broad dull red shade; margin dark, faintly cut by the whitish submarginal line; a chocolate brown triangular patch before apex, edged with white. Hind wing white at base, the margin broadly dark brown, joined to a discal spot. Expanse, 25 mm.

*Type.*—Male, No. 15473, Sierra de Guerrero, Mexico, August, 1912 (R. Müller).

## Subfamily NOCTUINAE.

### Genus ANOMIS Hübner.

**ANOMIS GYMNOPUS, new species.**

Fore wing bright reddish; lines dark red, edged with powdery lilacine; inner line flexuous, slender; outer strongly excurved over cell, wavy, erect and nearly straight below median vein; terminal space darker shaded, the subterminal line macular, dark, the spots separated below. Hindwing uniform blackish. A large swelling at base of costa of forewing of male. Expanse, 30 mm.

*Cotypes.*—Two males, No. 15474, U.S.N.M.; Cordoba, Mexico, May, 1906 (W. Schaus); Tuis, Costa Rica, June, 1907 (W. Schaus).

**ANOMIS EUCYSTICA, new species.**

Forewing purplish brown, stained with bright red on the lower half; lines brown; a dark patch at base on inner margin; inner line coarsely waved; outer excurved above, wavy, straight below from median vein; discal dots dark, obscure, or a white patch in lower part of reniform; margin darkly shaded; subterminal line continuous, broadly shaded, waved. Hindwing dark brown. Male with a swelling at base of costa of forewing; anal tuft white; hind tibiæ with long dense hairs. Expanse, 33 mm.

*Cotypes.*—Three males, No. 15475, U.S.N.M.; Jalapa, Mexico (Schaus collection).

### ANOMIS CATAGGELUS, new species.

Forewing brown with ocher tint, the markings dark brown; a patch at base on inner margin; inner line slender, irregularly dentate, oblique, reaching inner margin near middle; orbicular a ringlet; reniform a large somewhat quadrate blotch; outer line slender excurved above, wavy, forming a sinus below reniform; subterminal line shaded, wavy. Hind wing dark brown. Expanse, 36 mm.

*Cotypes.*—Two males, No. 15476, U.S.N.M.; Orizaba, Mexico, May, 1908 (R. Müller); Jalapa, Mexico (Schaus collection).

## Genus EULEPIDOTIS Hübner.

### EULEPIDOTIS SUPPURA, new species.

Silvery white; head and collar dark brown; fore wing with a dark brown oblique band from middle of costa to tornus; a curved slender band from outer third of costa to tornus, the space beyond purplish brown. Hind wing white, yellowish tinged on margin; a shaded quadrate apical brown patch; a double black spot before the tooth on margin, preceded by brown and silvery scales and a short brownish line. Expanse, 33 mm.

*Cotypes.*—Six specimens, No. 15477, U.S.N.M.; Cordoba, Mexico, February, 1908 (F. Knab); May, 1906 (W. Schaus); Orizaba, Mexico (Schaus collection); Aroa, Venezuela (Schaus collection).

Close to *P. electa* Dyar, but hind wing whiter, with orange only marginally between the spots; purple color of fore wing duller, marginal area divided into a paler, more lilaceous inner half and darker outer half by a pale ray.

### EULEPIDOTIS STIGMASTICTA, new species.

Bright green; tip of the abdomen orange; fore wing uniform green, with three very slender dark brown lines from costa to inner margin, approaching each other somewhat below, the inner with a round black spot on submedian, the outer with a small spot beyond it above vein 3, the line itself faintly duplicated. Hind wing with a broad green ray through the disk expanding on margin and a small one along submedian, the apex and tornus broadly bright orange; a brown patch before margin in the orange part followed by a little black speck in the green. Beneath, pale silky green, washed with orange at anal angle of hind wing. Expanse, 38 mm.

*Cotypes.*—Two males, No. 16103, U.S.N.M.; Orizaba, Mexico, June, 1911 (R. Müller) and one without further data (Schaus collection).

### EULEPIDOTIS GLAUCOPASA, new species.

Bright grass-green; fore wing with three faint dark subparallel lines, converging a little on inner margin; fringe brown. Hind wing green, a short projection in the middle of the margin, with a little speck, half silver, half black near it; a small partly metallic spot below vein 2 submarginally. Beneath washed with pale green, no markings, only the fringe spotted with darker. Expanse, 33 mm.

*Cotypes.*—Five specimens, No. 16104, U.S.N.M.; Jalapa, Mexico (Schaus collection); Cordoba, May, 1906 (W. Schaus); Orizaba, Mexico (R. Müller).

### EULEPIDOTIS SYLPHA, new species.

Like the preceding, except in the hind wings: Costal area broadly washed with pale orange, an orange ray in submedian fold and small streak at tornus; prominence on outer margin more rounded, the spot in its ultimate projection, not before it, the submarginal spot continued by a faint curved line up to the costal pale area. Expanse, 32 mm.

*Cotypes.*—Two specimens, No. 16449, U.S.N.M.; Avangarez, Costa Rica, July, 1909 (W. Schaus); Orizaba, Mexico (Schaus collection).

## Genus DYOMYX Guenée.

### DYOMYX ORA, new species.

Fore wing shaded with tan-brown at base and in terminal space up to vein 4; costa broadly lilacine gray; median space filled in with dark brown below up to middle of cell, the brown extending outward in a band across outer line to termen; lines dark brown, slender; subbasal half line reaching submedian; inner line oblique, with a tooth on discal fold, ending in a reddish patch on inner margin; median line crossing the cell just before the reniform, obscured in the dark filling below; reniform large, lunate, filled with the violaceous color of the costal margin; outer line excurved from costa to vein 2, dentate on the veins, ending in a small round ocellus on vein 1, black centered, orange ringed, then dusky; a subterminal row of obscure dots; a terminal dark line; fringe interlined. Hind wing brown, dark brown above vein 5 in an even line to base; a narrow dark brown ray along submedian; two brown lines across the disk, dentate, recurved about vein 2 and more approximate near inner margin; at their furthest outcurve some dark blue powdering, followed by two black spots on the margin, each preceded by a white arc; a broken pale orange line opposite middle of the outer margin; fringe dark with a pale line at base. Expanse, 45 mm.

*Type.*—Male, No. 16450, U.S.N.M.; Jalapa, Mexico (Schaus collection).

### DYOMYX CONSEQUENS, new species.

Gray brown, slightly bronzy; fore wing with the lines slender, dark brown; basal half line, inner line and median line all oblique, parallel; outer line bent at vein 6 and 3, faint below, running close to median line, becoming a white dash above inner margin; subterminal line wavy, faint. Hind wing with an oblique inner line and parallel mesial line, the latter becoming submarginal below vein 2 and dentate; two black spots before the marginal tooth, joined by a white arc, which is preceded by blue and white powdering. Expanse, 38 mm.

*Cotypes.*—Five specimens, No. 15478, U.S.N.M.; Orizaba, Mexico, August, 1909 (R. Müller); Coatepec, Mexico (Schaus collection); Chiriqui, Panama (Schaus collection); Aroa, Venezuela (Schaus collection).

Close to *D. egista* Bar, but the white mark of fore wing following the median line instead of the outer line, narrower, straighter, less pure white; reniform full, elliptical, not narrow and lunate.

## Genus ACHAEA Hübner.

### ACHAEA DEMEPA, new species.

Light gray; fore wing with the base above vein 1 washed with pale brown, mixed with black irrorations; inner line black, broad, blotched on costa and in cell, broken on vein 1, outcurved between that and inner margin; median space light gray, irroate with black; a black dot for orbicular; reniform annular, with two blotches on costa above it; median shade obvious below median vein, wavy, indistinctly double; outer line excurved over cell, slender, irregular, incurved to base of vein 3, thence straight and a little oblique, broad and distinct to inner margin; a brown shade following this line; subterminal lines shaded, broken into spots above, of which one large one occupies the space between veins 4 and 6; a second shaded line close to the margin; a fine crenulate terminal line; fringe whitish. Hind wing whitish, powdered with black; a large blackish discal mark, three slender crenulate lines between this and margin; terminal lines and fringe as on fore wing. Expanse, 57 mm.

*Type.*—Female, No. 15479, U.S.N.M.; Misantla, Mexico, July, 1912 (R. Müller).

## Genus CAMPOMETRA Guenée.

### CAMPOMETRA SURRECTA, new species.

Blackish, with a warm brown undertint; fore wing with the lines velvety black; inner line arcuate, coarsely crenulate; median line similar, straighter; outer line similar, more sharply dentate, starting from a semicircular dark-brown costal spot with a shaded luteous edge, sharply indrawn below reniform, forming a short dash above vein 2;

reniform indicated by white powdery spots; subterminal line parallel to margin, finely crenulate; a row of light specks with black edges close to margin; a crenulate black terminal line. Hind wing like the fore wing with two outer dentate black lines, inwardly arcuate on central segment, the submarginal one lightened by reddish in places; a straight pale ray from middle of wing to tornus; terminal markings as on fore wing. Expanse, 45 mm.

*Type.*—Male, No. 15480, U.S.N.M.; Misantla, Mexico, May, 1912 (R. Müller).

### Genus RHOSOLOGIA Walker.

#### RHOSOLOGIA STIGMAPHILES, new species.

Clayey whitish with dark irrorations; reniform widely outlined in black, forming a wedge-shaped spot above bases of veins 3 and 4 and erect fainter outer and inner columns, the top open. In the male this is practically the only marking; all the space below the cell shaded with warm brown; subterminal line pale, broadly waved and followed by warm brown. In the female the brown shading is restricted to areas following the lines; a curved line runs from the origin of vein 2 to the inner margin and there is a subbasal line running obliquely outward to subcosta near middle of cell, then sharply retracted; the ground of the wing is clearer than in the male, the markings more relieved. Hind wing deep brown, pale at base. Expanse, male, 38 mm; female 36, mm.

*Cotypes.*—Male and female, No. 18197, U.S.N.M.; male, Zacualpan, Mexico, August, 1909 (R. Müller); female, Orizaba, Mexico (Schaus collection). Also another female, Oaxaca, Mexico (Schaus collection).

#### RHOSOLOGIA DIDACTICA, new species.

Russet brown, powdered with blackish; lines pale, defined by dark scales; inner line slightly curved and a little irregular; mesial line straight and erect across wing, followed by a deepening of the ground, which ends at the blackish angular remains of the reniform; subterminal line wavy and irregular, preceded by brown and followed by blackish; a row of terminal black spots. Hind wing shaded with fuscous brown outwardly, paler at base. Expanse, 30 mm.

*Type.*—Male, No. 18198, U.S.N.M.; Sierra de Guerrero, Mexico, June, 1913 (R. Müller).

## Subfamily HYPENINAE.

### Genus GUSTIANA Walker.

#### GUSTIANA MOX, new species.

Fore wing light gray, slightly violaceous; subbasal, inner and outer lines straight, oblique, dark brown, preceded by broad olive brown shades, broader on inner margin; subterminal line slender, finely wavy; margin darker shaded. Hind wing dark brown. Expanse, 18 mm.

*Cotypes.*—Two females, No. 15481, U.S.N.M.; Misantla, Mexico, August, 1912 (R. Müller); Jalapa, Mexico (Schaus collection).

Near *G. guarda* Schaus,[1] but smaller, the lines straighter and more parallel, the ground color less uniform, the subterminal line about as distinct as the others.

## Family NOTODONTIDAE.

### Genus DICENTRIA Herrich-Schäffer.

#### DICENTRIA CERRIBEN, new species.

Dark gray; a round, black, discal dot, surrounded by a dark cloud; a black streak at base on submedian fold; veins black lined; a series of black costo-subapical streaks, with fainter ones below in the interspaces, followed below vein 2 by traces of a dentate outer line; this is followed by black and a whitish streak about vein 2; inner area slightly ochreous; outer margin oblique below vein 4, with short projections at the vein ends. Hind wing white, with a gray patch on termen and fringe beyond tornus. Expanse, 40 mm.

*Type.*—Male, No. 18199, U.S.N.M.; Zacualpan, Mexico, August, 1913 (R. Müller).

#### DICENTRIA CLAMMENHOA, new species.

Fore wing bluish gray on costal half, gray on inner half; discal spot small, black, round, on a linear arc, followed by a long black dash below vein 5; veins 2–6 black-lined; a dark cloud beyond end of cell, reaching costa; a black dash above vein 7, adjacent to linings on the subcostal venules; black dashes subterminally between the veins, the one above vein 6 nearer the margin, the others farther inward; ordinary lines faint, dentate, blackish, indistinctly double, filled or followed by whitish; a slender black streak on submedian fold from base nearly to vein 2. Hind wing whitish, gray at apex, and with some dark spots about anal angle. Expanse, 53 mm.

*Type.*—Male, No. 16497, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller). Very similar to *Schizura biedermani* Barnes and McDunnough.[2]

### Genus PSILACRON Felder.

#### PSILACRON MACARISMA, new species.

Thorax dark greenish gray, the collar a little mixed with rusty yellow. Fore wing of the same dark color, with marginal, nearly white patches from vein 2 to vein 4, the margin else and patches over the outer half of wing of rusty yellow; veins black-lined; a black dash on submedian at base; discal dot clouded, black; lines very indistinct, only the submarginal visible, black, dentate, parallel to the margin and rather remote, with small white points on the veins. Hind wing gray, whitish over the disk, a pale, illy defined outer line; anal area dark gray, cut by the pale line; fringe spotted. Expanse, 46 mm.

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[1] Trans. Amer. Ent. Soc., vol. 30, 1904, p. 168.

[2] Journ. N. Y. Ent. Soc., vol. 19, 1911, p. 81.

*Type*.—Male, No. 16498, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

### Genus MALOCAMPA Schaus.

#### MALOCAMPA TREPSORA, new species.

Gray-brown; a little touched with violaceous, especially at apex and tornus; lines fine, double, dentate, brown and not contrasted, the inner oblique, the outer gently curved; two small black discal spots, well separated; beyond the outer line at costa is a brown area cut by pale flecks, with a black bar below in violaceous. Hind wing fuscous brown; a white bar above tornus, the fringe mixed with yellowish. Expanse, 38 mm.

*Type*.—Male, No. 16499, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

Allied to *M. matralis* Schaus.

## Family LASIOCAMPIDAE.

### Genus TOLYPE Hübner.

#### TOLYPE VEMERILA, new species.

Pale gray, nearly white, a small tuft of flattened black hairs at base of thorax; lines dark gray, cut by the white veins, broadened on costa; double inner and outer lines, irregularly waved, bent subcostally; a single submarginal macular band. Hind wing gray shaded, the veins darker. Expanse, 27 to 28 mm.

*Cotypes*.—Two males, No. 15482, U.S.N.M.; Sierra de Guerrero, Mexico, September, 1912 (R. Müller); Tehuacan, Mexico, September, 1910 (R. Müller).

#### TOLYPE SYNOECURA, new species.

Pale pinkish, marked with brown as in *T. plurilinea* Walker, but the pattern of markings is different. Basal space and cell light in the male, the wing crossed by pale waved lines, the ordinary inner and outer ones nearly straight, except for some angulations on the veins; area between them from vein 2 to vein 5 dark, and a dark streak on the stem of veins 6 to 8. Of the supernumerary lines, two within the inner line are similar to it, but less distinct; two beyond the outer line are somewhat wavy, sparated from each other and the subterminal by dark clouds; subterminal line wavy; fringe spotted with brown. Hind wing pale, creamy. Expanse, 34 mm.

The female is similar, duller in tone, the pale lines less relieved. Expanse, 53 mm.

*Cotypes*.—Male and female, No. 16451, U.S.N.M.; Teapa, Tabasco, Mexico, April, 1913 (R. Müller).

## Family LIPARIDAE.

### Genus LEUCULODES Dyar.

**LEUCULODES DIANARIA, new species.**

Translucent white; costa of fore wing black at base; vertex of head ocher; pectinations of antennæ yellowish. Expanse, 25 mm.

*Cotypes.*—Two males, No. 16500, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

Close to *D. lacteolaria* Hulst, smaller and without lines on the fore wing.

## Family GEOMETRIDAE.

### Genus PSALIODES Guenée.

**PSALIODES OROZCOA, new species.**

Fore wing whitish, with greenish yellow suffusion, marked with dark brown; median band dark brown, broad, strongly sinuate; marginal band forming a triangular patch above, narrow below, its inner edge lunulate between the veins, whitish edged; base narrowly dark; costa dark spotted; subbasal and subterminal spaces clear yellowish, irrorate with dark, the lines white, crenulate, edging the mesial band. Hind wing fuscous, a little mottled with whitish centrally, defining a faint mesial band. Expanse, 27 mm.

*Type.*—Female, No. 18200, U.S.N.M.; Zacualpan, Mexico, August, 1913 (R. Müller).

### Genus TEPHROCLYSTIA Hübner.

**TEPHROCLYSTIA MAGNIFACTA, new species.**

Dark gray, a little purplish; the inceptions of eight or nine lines in gray may be seen on costa, but obsolete below; short black streaks on median vein; a row of short dashes for outer line and another for subterminal; termen darker, more purplish; subbasal line distinct across the wing; discal dot elliptical, black. Hind wing with five or six lines on the inner margin, obsolete above. Expanse, 26 mm.

*Type.*—Female, No. 18201, U.S.N.M.; Zacualpan, Mexico, August, 1913 (R. Müller).

### Genus APICIA Guenée.

**APICIA ENTOCHYNA, new species.**

Whitish clayey with fine, faint, brown strigæ; inner line fine, bent at right angles at median vein beyond origin of vein 2; discal dot round, dark; outer line brown, straight from inner margin to above vein 7, where it becomes slender and reflexed to costa. Hind wing with a single mesial brown line beyond the cell, evenly curved and parallel to the outer margin; a faint discal dot. Expanse, 29 mm.

*Type.*—Male, No. 18202, U.S.N.M.; Zacualpan, Mexico, August, 1913 (R. Müller).

In all the forms of *vibicaria* Cramer before me the line on hind wing tends to be straight with a pale outer border, never regularly curved as in this species.

### Genus SPODODES Warren.

#### SPODODES AURANTICOLOR, new species.

Yellow, slightly orange tinted, with sparse orange-brown strigæ, thick and purplish along costa; inner line wavy, expanded into purplish spots, especially on submedian; discal dot round; outer line expanded with spots on discal and submedian folds, itself nearly obsolete, running inward along vein 2 so that there are two patches on submedian fold; a small patch submarginally at vein 5. Hind wing similar; discal spot, a patch on inner margin, traces of outer line and three spots submarginally before apex, middle, and tornus, respectively. Expanse, 25 mm.

*Type*.—Male, No. 18203, U.S.N.M.; Zacualpan, Mexico, August, 1913 (R. Müller).

### Genus COENOCHARIS Hulst.

#### COENOCHARIS CORNIFRONS, new species.

Front with a large conical protuberance with a short tooth beneath it. Fore wing gray along costa, the rest more ocherous gray, all strewn with dark atoms, slightly streaked toward apex; lines obsolete; discal dot round, black. Hind wing ocherous gray, broadly fuscous over apex, narrower on margin below; discal dot round, fuscous. Expanse, 32 mm.

*Type*.—Male, No. 18204, U.S.N.M.; Sierra de Guerrero, Mexico, June, 1913 (R. Müller).

## Family COCHLIDIIDAE.

### ZAPARASA, new genus.

Fore wing with veins 3 to 5 separate, 6 from the middle of the cell, obsolescent at base, 7 and 8 stalked, 9 absent, 10 and 11 on the cell. Hind wing with all the veins present, normal. Antennæ of male bipectinated to three-fourths, the tip simple. Hind tibiae with apical spurs only.

*Type of the genus*.—*Zaparasa sylvia*, new species.

#### ZAPARASA SYLVIA, new species.

Head and thorax green; abdomen ocher-brown. Fore wing green, becoming yellow toward costa; a wide triangular light-brown patch on costa from near base to middle, crossing the cell to vein 2; a light-brown outer border, incised subcostally and more deeply at veins 4–5. Hind wing pale cream color. Expanse, 21 mm.

*Type*.—Male, No. 16501, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

### Genus METRAGA Walker.

#### METRAGA COSTILINEA, new species.

Fore wing dark bronzy brown; a slender silvery line subbasally to median vein, running out along vein 2; a costo-subapical bent silvery line, followed by rusty yellow; discal area shining, preceded and followed by black shade lines; discal dot black, elongate, inconspicuous; a marginal whitish line with dentations at the veins. Hind wing yellowish, overspread with brown in the male, brown in the female; fringe touched with dark brown at tornus. Expanse, male, 19 mm; female, 30 mm.

*Cotypes.*—One male, two females, No. 16502, U.S.N.M.; male, Teapa, Tabasco, Mexico, January, 1913 (R. Müller); female, Coatepec, Mexico, October, 1910 (R. Müller); female, Orizaba, Mexico (Schaus collection).

## Family LACOSOMIDAE.

### Genus CICINNUS Blanchard.

#### CICINNUS CHABAUDI, new species.

Violaceous gray, thickly irrorated with coarse black scales, the margins of both wings smooth olive gray without irrorations; two purplish subparallel lines running across both wings, the outer more distinct on hind wing than inner, on fore wing bent at an angle at vein 7, but obscure; a little fiery reddish on hind wing below outer line; discal dot on fore wing purplish, followed by a white space. Expanse, 50 mm.

*Type.*—Male, No. 16503, U.S.N.M.; Zacualpan, Mexico, June, 1913 (R. Müller).

Named for Mr. Alfredo Chabaud, who collected the species.

## Family THYRIDIDAE.

### COSMOTHYRIS, new genus.

Palpi short, porrect, hardly exceeding the front; fore wing with veins 2–11 from the cell, 6–7 from a point at apex of cell, 9 and 10 well removed from apex; cell closed; hind wing with veins 2–7 from the cell, cell closed, vein 5 from near lower angle; wings triangular, elongate, margins entire.

*Type of genus.—Cosmothyris margaretta,* new species.

#### COSMOTHYRIS MARGARETTA, new species.

Pale stramineous; strigæ brown, transverse and evenly distributed; a central brown band on both wings, either uniform and a little flexuous or, on fore wing, constricted and broken centrally and on hind wing attenuated toward margin. Expanse, 21 mm.

*Cotypes.*—Male and female, No. 16504, U.S.N.M.; Cuernavaca, Mexico, June, 1906 (W. Schaus); Zacualpan, Mexico, May, 1913 (R. Müller).

# Family PYRALIDAE.

## Subfamily PYRAUSTINAE.

### Genus EDIA Dyar.

**EDIA EXTRALINEA, new species.**

Blackish gray, the veins finely lined in whitish; outer line whitish, curved, close to the margin at apex, but running to near middle of wing on inner margin, followed by a dark line. Hind wing fuscous. Expanse, 14 mm.

*Type.*—Male, No. 15483, U.S.N.M.; Tehaucan, Mexico, September, 1913 (R. Müller).

Close to *Edia belialis* Druce (*Pionea belialis* Druce[1]), but without yellowish ground, the outer line single. I have identified as *belialis* Druce specimens from Colorado[2] which agree with Druce's figure of the type from Amula, Guerrero, Mexico, but I have not had Mexican specimens for comparison. Two other species of *Edia* will have synonymy as follows:

**EDIA HELIANTHIALES Murtfeldt.**

*Titanio helianthiales* Murtfeldt, Can. Ent., vol. 29, 1897, p. 71.
*Pionea thyanalis* Druce, Biol. Cent.-Amer., Lep. Het., vol. 2, 1899, p. 557.

**EDIA BIDENTALIS Barnes and McDunnough.**

*Cynaeda bidentalis* Barnes and McDunnough, Cont. Nat. Hist. Lep. North Amer., vol. 1, pt. 5, 1912, p. 33.
*Edia microstagma* Dyar, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 320.

### Genus LIPOCOSMA Lederer.

**LIPOCOSMA ILLOSALIS, new species.**

Dark brown, thickly irrorate on a pale straw-colored ground, dark in fresh specimens, the marks obscured, lighter in old ones and the markings then more relieved. Lines single, dark, the inner curved, the outer curved to vein 2, then again below; a quadrate discal patch of two opposed cusps, filled in between by dark color; a whitish spot beyond, distinct in fresh specimens; a dark terminal line. Hind wing pale at the base, shaded with dark brown outwardly in the middle; an outer curved dark brown line; a terminal dark line; a dark ray on submedian fold, interrupted by a white dot. Expanse, 15 mm.

*Cotypes.*—Four specimens, No. 16452, U.S.N.M.; Tehuacan, Mexico, April, 1913 (R. Müller).

### Genus SYNGAMIA Guenée.

**SYNGAMIA FLOREPICTA, new species.**

Rose-pink with pale yellow patches edged by dark lines; fore wing with a small hyaline-white spot near base of cell; a double yellow patch, half on costa beyond end of cell, the other portion on inner margin, entering cell, and not quite touching the outer portion. Hind wing with a broad median band, widening in its central third, leaving a narrow rose-pink margin; a white-hyaline spot in cell. Expanse, 18 mm.

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[1] Biol. Cent.-Amer., Lep. Het., vol. 2, 1899, p. 557.
[2] Proc. U. S. Nat. Mus., vol. 25, 1902, p. 397.

*Type.*—No. 16453, U.S.N.M.; Cerritos, San Luis Potosi, Mexico, August, 1911 (R. Müller).

## Genus BOCCHORIS Moore.

### BOCCHORIS REHAMALIS, new species.

White, with a faint ocher tint, marked with broad anastomosing dark brown lines; fore wing with costal fourth brown, followed by five scattered dots; an oblique band near base; inner band roundedly furcate on subcosta, straight below; outer band starting on middle of inner margin, touching the elliptical, open-centered reniform, reflexed to submarginal line, incurved, touching the submarginal again subapically; submarginal line with two bars to join the terminal line. Hind wing with straight, broad mesial band; outer line also straight, joining the submarginal near vein 2; submarginal line with two bars to the outer line as on fore wing. Expanse, 19 mm.

*Cotypes.*—Two specimens, No. 16454, U.S.N.M.; Tehuacan, Mexico, August and October, 1910 (R. Müller).

## Genus CLINIODES Guenée.

### CLINIODES MOSSALIS, new species.

White; fore wing with a large brown patch covering cell and extending a little below and beyond it, leaving a small lunate spot at end of cell; a broad submarginal band of light blue-gray, reaching apex, bent on vein 1; a marginal brown band, which touches the gray band above and overlaps it a little, producing a deeper color; a row of terminal black dots. Hind wing translucent white, with terminal black dots centrally; fringe opaque white. Expanse, 35 mm.

*Type.*—No. 16455, U.S.N.M.; Tehuacan, Mexico, June, 1910 (R. Müller).

## Genus PILOCROCIS Lederer.

### PILOCROCIS CORA, new species.

Palpi broadly scaled, the third joint appressed, first and half of second joints white below. Blackish with violaceous reflection; lines blackish, the outer bordered with whitish, excurved over the discocellulars, retracted below the end of the cell; discal mark black, lunate. Fringe of hind wing white outwardly. Expanse, 30 mm.

*Type.*—Male, No. 16458, U.S.N.M.; Orizaba, Mexico, October, 1907 (R. Müller).

Male with a costal fold at base of fore wing, without projecting hairs. Like *P. ramentalis* Lederer in coloration, but only the outer line whitish edged and that indistinctly so. A female from Trinidad is like the male. Another female from Trinidad and three from Orizaba and Tehuacan, Mexico, are less distinctly marked, the whitish border of the outer line being lacking on both wings.

### Genus ISCHNURGES Lederer.

#### ISCHNURGES CHROMOPHILA, new species.

Fore wing yellow, marked with pink; a band on basal third of costa, becoming powdery centrally; a round spot in cell; reniform large, pink, joined to costa and to the projection of outer border; terminal border pink, joined along costa to a trace of subterminal line, crenulate within, joined to a bar rising from before tornus. Terminal third of abdomen pink. Expanse, 17–20 mm.

*Cotypes.*—Three females, No. 16512, U.S.N.M.; Tehuacan, Mexico, July, 1909 and 1913 (R. Müller).

Near *I. perpulchralis* Hampson, but differing in markings and without pink on hind wing.

### Genus DIASEMIA Guenée.

#### DIASEMIA PARTICOLOR, new species.

Straw yellow; fore wing with reddish brown shadings at base; reniform fused in a purple shade that occupies most of the area beyond the outer line; terminal area narrowly yellow, widening subapically and narrowed centrally; outer line red-brown above, where the purple shading is incomplete, faint below, appearing as if looped up over the reniform, then nearly straight and perpendicular to margin. Hind wing of the same light yellow; a large purple cloud at apex; smaller clouds at tornus and following it submarginally; a minute discal dot, followed by a streak across inner area. Expanse, 19 mm.

*Type.*—Female, No. 16505, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

### Genus LIOPASIA Möschler.

#### LIOPASIA MACULIFIMBRIA, new species.

Wood-brown, sordid; inner line obsolete, but its location followed by a black streak on submedian fold, below which a dark brown shade fills median space below the fold; outer line oblique from costa, black, slender, joining a dark shade that fills the terminal space between veins 3–6, then shown as obscure light flecks retiring very obliquely across vein 1 to the inner margin; an oblique dark streak from lower angle of cell to outer line along vein 3; terminal dots black, minute; a light line in base of fringe and series of black spots at the ends of the veins. Hind wing sordid whitish, darker shaded about apex, fringe indistinctly spotted. Expanse, 30 mm.

*Type.*—Female, No. 16506, U.S.N.M.; Zacualpan, Mexico, May, 1913 (R. Müller). Also two worn females, Cuernavaca, Mexico, April, 1912 (R. Müller).

This species seems nearest to *Liopasia,* though there is no scale-tuft at anal angle of fore wing.

## Genus PHLYCTAENODES Guenée.

### PHLYCTAENODES PHRIXALIS, new species.

Pale straw yellow, dusted with brown; lines very slender, brown; inner line oblique across cell, angled across submedian fold; outer line sharply dentate between the veins, excurved above, forming a sinus at vein 2 and a tooth outward on submedian fold; marginal brown shade dentate on the veins with slight preceding intervenular streaks; orbicular and reniform brown, solid; some brown powdering below reniform. Hind wing with a faint shaded discal dot; mesial line similar to outer line of fore wing, not attaining the costa; termen as on fore wing, the subterminal streaks shaded, forming a faint zigzag line. Expanse, 29 mm.

*Type.*—Female, No. 16510, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

## Genus PIONEA Guenée.

### PIONEA DISCORDALIS, new species.

Dark brown, a slight yellow under tint showing especially about outer line; lines blackish, slender; inner line not reaching costa, wavy, upright; outer line broadly excurved, dentate between veins, forming a sinus at vein 2 and an angle on submedian fold; orbicular a dot; reniform lunate, black, solid; terminal line black, followed by a light line in base of fringe. Hing wing slightly bronzy, nearly as dark as fore wing; veins dark; a black point in center of cell; a smooth mesial line, nearly parallel to outer margin, excurved slightly over the discal venules; termen as on fore wing. Expanse, 28 mm.

*Type.*—Male, No. 16511, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

## Genus PYRAUSTA Schrank.

### PYRAUSTA STERNIALIS, new species.

Slender; fore wing pointed at apex, rather thinly scaled; vein 10 touching 9 at several points after origin but not actually anastomosing; straw yellow, brown irrorate; lines brown, rather thick; inner line arcuate; outer line straight above to vein 2, running in thence to below cell and again straight to margin; orbicular a dot; reniform a double bar. Hind wing with a single line like the outer on fore wing. Expanse, 18 mm.

*Type.*—Male, No. 16507, U.S.N.M.; Zacualpan, Mexico, May, 1913 (R. Müller).

### PYRAUSTA POSTAPERTA, new species.

Gray, tinged with crimson; lines slender, dark; inner line dentate on vein 1; outer line excurved over cell, denticulate, running in below, making a shallow sinus below median vein and a little on vein 1; restricted yellow patches before inner line, in cell and beyond outer line and a trace on termen and fringe; orbicular and reniform small, dark; a terminal dark line. Hind wing whitish; an erect gray line across disk from near end of vein 2 to middle of costa, before which the veins and discal dot are lightly gray; beyond it a clear space; a gray terminal border and darker line. Expanse, 20 mm.

*Type.*—Male, No. 16508, U.S.N.M.; Mexico City, Mexico, October, 1908 (R. Müller). Also three males and one female from the same place with additional data May, 1909 (R. Müller); one female, Oaxaca, Mexico (Schaus collection).

### PYRAUSTA DISSIMULANS, new species.

Yellow, tinged with crimson; inner line straight; outer line smoothly excurved to vein 2, then straight; space between shaded with crimson-gray; apex clouded with same color, sending down a straight submarginal band. Hind wing yellow, translucent, a mesial faint straight gray line and faint discal dot close to it; a nearly marginal dark gray band, widening at apex; termen touched with crimson. Expanse, 20 mm.

*Type.*—Female, No. 16509, U.S.N.M.; Mexico City, Mexico, July, 1913 (R. Müller).

## Subfamily NYMPHULINAE.

## Genus CLUPEOSOMA Snellen.

### CLUPEOSOMA PSEUDOPIS, new species.

Fore wing straw-yellow, dusted with brown; lines brown, smooth; subbasal line slight, curved; inner line strongly angled on median vein to origin of vein 2, vein 2 and median vein beyond brown, inclosing, with the outer line, a discolorous whitish space; orbicular a point or absent; reniform an arc; outer line strongly excurved opposite cell; a purplish cloud filling most of terminal area below vein 6. Hind wing whitish, straw-color at tip; some purplish on termen and fringe. Expanse, male, 18 mm.; female, 23 mm.

*Cotypes.*—Two males, one female, No. 16513, U.S.N.M.; Zacualpan, Mexico, July, 1913, and November, 1911 (R. Müller).

### CLUPEOSOMA SUFFLEXALE, new species.

Fore wing whitish straw-color shaded and blotched with brown; subbasal line lost in brown mottlings; inner line bent at right-angles, the point at origin of vein 2; orbicular a dot; reniform an arc; outer line excurved above opposite cell, slightly flexuous, angled on vein 1;

veins brown lined; subterminal line straight, rather broad, dark brown, bent below costa; subterminal space filled with brown shading except toward costa; terminal space forming a row of pale yellow spots by the brown veins and double terminal line. Hind wing straw-whitish; a very faint outer line; terminal line double as on fore wing. Expanse, 22 mm.

*Type.*—Female, No. 18210, U.S.N.M.; Mexico City, Mexico, November, 1908 (R. Müller). Also three males and one female, Popocatepetl Park, Mexico, 8,000 feet, June, 1906 (W. Schaus), and one male, Iguala, Guerrero, Mexico, June, 1906 (W. Schaus).

### Genus STENIA Guenée.

#### STENIA BENETINCTALIS, new species.

Fore wing soiled white, shaded with brown from the costa downward and with blackish broadly over apex; lines blackish; the inner showing only below median vein; a point in cell and spot at end, below which latter is a wavy median band, the inner segment of the outer line; outer line excurved over the discal venules, the connection to the inner segment along vein 2 very faint; a terminal row of small, well-separated dots. Hind wing whitish with a small discal dot, the outer line excurved over the discal nervules, only a trace of the oblique retracted portion; a blackish patch at apex. Expanse, 15 mm.

*Type.*—No. 16456, U.S.N.M.; Teapa, Tabasco, Mexico, October, 1912 (R. Müller).

## Subfamily CHRYSAUGINAE.

### Genus GALASA Walker.

#### GALASA UNIFACTALIS, new species.

Hind wing with vein 3 absent, 2 from the cell, 4 and 5 separate, closely approximated at base. Fore wing with vein 3 from the cell in the male or close to it, stalked in the female, vein 8 absent in the male. Male with two indentations on the costa, female with a single shallow emargination. Fore wing deep purple, a little shining, uniform in the male, showing a little red tint on costa in female, especially on the basal lobe; lines nearly obsolete, consisting of rows of white points, curved, parallel, dividing the wing nearly evenly in thirds, more approximated in the male. Hind wing pale fuscous, darker and uniform in the female, a little pale over the base and inner area in the male. Fringe of inner margin touched with dull crimson. Head roughly scaled on vertex and dull ocher. Expanse, male, 15 mm.; of female 15–17 mm.

*Cotypes.*—One male, two females, No. 16255, U.S.N.M.; Jalapa, Mexico (Schaus collection); Misantla, Mexico, August, 1912 (R. Müller); Orizaba, Mexico (Schaus collection).

### TIPPECOA, new genus.

Fore wing with vein 2 from the cell, 3 to 5 stalked, 6 below apex of cell, 7 and 8 stalked, 9 and 10 absent, 11 anastomosing with 12. Hind wing with 2 from the cell, 3 and 5 stalked, 4 absent. Differs from *Xantippe* in the loss of veins 9 and 10 of fore wing and 4 of hind wing.

*Type of the genus.—Tippecoa infans*, new species.

#### TIPPECOA INFANS, new species.

Fore wing reddish ocher, the lines dark, shading centrally, making the median space appear darker than the rest of the wing, inner straight, outer incurved on submedian fold; a faint terminal dark line. Hind wing fuscous, fringe pale. Expanse, 11 mm.

*Type*.—No. 16457, U.S.N.M.; Teapa, Tabasco, Mexico, December, 1912 (R. Müller).

### CROMARCHA, new genus.

Pali slender, porrect, curved toward each other at tips, extending nearly twice the length of the head. Fore wing with vein 2 long before the angle of the cell, 3–5 stalked, 6–9 stalked, 10 absent, 11 from the cell. Hind wing with 3 before the angle of the cell, 4–5 stalked, 6–7 stalked, 7 anastomosing with 8.

*Type of the genus.—Cromarcha polybata*, new species.

#### CROMARCHA POLYBATA, new species.

Fore wing carneous brown at base and along inner margin below the submedian fold to outer line; subbasal area gray with scattered black scales, forming a wide wedge ending in a point above the margin near an angle thickly clothed with black scales; next a costal white wedge ending at submedian fold; discal area bright red-brown inwardly, purple-brown outwardly; a red streak above submedian fold and small purple reniform; outer line whitish, double, wavy, crossing the purple field; a subterminal white band, bent out below vein 5, narrowing to tornus; terminal space purple, red-brown at apex. Hind wing fuscous. Expanse, 20 mm.

*Type*.—Male, No. 16516, U.S.N.M.; Tehuacan, Mexico, July, 1913 (R. Müller).

### BALIDARCHA, new genus.

Palpi slender, porrect, curved toward each other at tips, extending nearly twice the length of the head. Fore wing with veins 2, 3 separate, 4–5 shortly stalked, 6–9 stalked, 6 shortly so, 10 absent, 11 from the cell. Hind wing with 4–5 from a point, 6–7 stalked, 7 anastomosing with 8 shortly.

*Type of the genus.—Balidarcha cuis*, new species.

### BALIDARCHA CUIS, new species.

Whitish brown, slightly olivaceous, the rather narrow median space a shade darker, bounded by two faint, white, slender lines; faint traces of a subterminal pale line. Hind wing pale fuscous tinted, a little darker about apex and margin. Expanse, 17 mm.

*Type.*—Male, No. 16517, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

### ANEMOSELLA, new genus.

Palpi porrect, rostriform, downcurved, extending about three times the length of the head. Fore wing with veins 2 to 5 separate, 6–10 stalked, 11 free. Hind wing with 3 before the angle of the cell, 4–5 from a point, 6 from apex of cell, 7 anastomosing with 8.

*Type of the genus.*—*Anemosella basalis*, new species.

### ANEMOSELLA BASALIS, new species.

Fore wing long, parallel sided, brownish gray, crossed by two white smooth parallel oblique lines; basal space wide, dark brown; a patch of dark brown at apex; discal spot gray. Hind wing grayish over pale straw-color, a dark cloud along submedian fold outwardly. Expanse, 25 mm.

*Type.*—Female, No. 16514, U.S.N.M.; Zacualpan, Mexico, June 1913 (R. Müller).

### MYOLISA, new genus.

Palpi thick, roughly scaled, slender at base, porrect, rostriform, downcurved, exceeding twice the length of the head; front with a sharp conical tuft. Fore wing with veins 2 to 5 separate, 7–9 stalked, 10 and 11 on the cell. Hind wing with 2 to 5 separate, 6 from apex of cell, 7 and 8 anastomosing. Fore wing of male without tympanic vesicle.

*Type of the genus.*—*Myolisa chattinis*, new species.

### MYOLISA CHATTINIS, new species.

Pale creamy ocher; discal dot large, round, brown-black; costal edge narrowly brown-black; an oblique line straight across wing near the middle, red-brown, lightly traced but followed below by a spreading reddish shade; outer line very faint and fine, brown, flexuous, excurved opposite cell; a costo-subapical faint dark cloud. Hind wing soiled whitish with red-brown powdering about apex and margin. Expanse, 20 mm.

*Type.*—Male, No. 16515, U.S.N.M.; Tehuacan, Mexico, October, 1910 (R. Müller).

## Subfamily SCHOENOBIINAE.

### ZABOBA, new genus.

Palpi porrect, slightly thickened, straight and extending three times the length of the head. Fore wing with veins 2 and 3 close together before the angle of the cell, 4–5 long-stalked, 6 from apex of cell, 7–9 stalked, 10 absent, 11 on the cell close to apex and curved at base. Hind wing with 2 before the angle of the cell, 3 and 5 approximated at base, 4 absent, 6–7 stalked, 7 anastomosing with 8.

*Type of the genus.*—*Zaboba pyraloides*, new species.

### ZABOBA PYRALOIDES, new species.

Fore wing grayish brown, a little more ocherous along costa and apex; lines blackish, somewhat diffused; inner line in-angled in cell, followed by a round dot, excurved across submedian; outer line running in a little to vein 5, then projected outward and denticulate over the nervules, inward a little across the submedian area; termen with denser dark irrorations. Hind wing brown-gray, without any ocherous; a faint dark mesial line, running in along submedian fold. Expanse, 23 mm.

*Type.*—Female, No. 16518, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

## SCHACONTIA, new genus.

Fore wing with veins 4 and 5 stalked; 6 and 7 stalked from below angle of cell; 8 to 10 stalked, 10 small or obsolete, 11 from the cell. Hind wing with 3 near angle of cell, 4 and 5 stalked, 8 anastomosing with 7. Palpi porrect, slender, exceeding the front; front with conical prominence.

*Type of the genus.*—*Schacontia medalba* Schaus.[1]

### SCHACONTIA REPLICA, new species.

Fore wing dark olive brown at base, angled centrally; median area washed with white, shading to olive brown again before the outer line; this line whitish, shading outwardly, excurved on upper half nearly to outer margin, then straight, angled on vein 1 and oblique to middle of inner margin. Hind wing soiled whitish, with curved fuscous submarginal line. Expanse, 19 mm.

*Type.*—Female, No. 15484, U.S.N.M.; Orizaba, Mexico, March, 1912 (R. Müller).

Similar to *S. medalba* in color and pattern, but the dark basal space of fore wing smaller, the median whitish area consequently wider.

### SCHACONTIA CHANESALIS Druce.

*Pionea chanesalis* Druce, Biol. Cent.-Amer., Lep. Het., vol. 2, 1899, p. 557, pl. 101, fig. 8.

Mr. Schaus sent me a specimen of *S. replica* labelled "*chanesalis* Druce," but according to Druce's figure and description, *chanesalis* has the medial white area very narrow, almost a band. It will undoubtedly fall in this genus. *S. chanesalis* is from Guatemala.

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[1] *Acontia? medalba* Schaus, Trans. Amer. Ent. Soc., vol. 30, 1904, p. 163.

## Subfamily CRAMBINAE.

### Genus CULLADIA Moore.

**CULLADIA BELLIFERENS, new species.**

Fore wing silvery white; inner band ocher yellow, inwardly oblique, with spotted black edges; outer band of same color, from costa at outer fourth, touching the margin above middle, then curved to inner margin at outer fourth; terminal line blackish; fringe yellow; a small space of yellow at extreme base of wing. Hind wing pale fuscous. Expanse, 12 mm.

*Type.*—Female, No. 16522, U.S.N.M.; Orizaba, Mexico (Schaus collection).

### Genus UBIDA Walker.

**UBIDA STRICTALIS, new species.**

Male antennæ pectinated. Fore wing with the costal area to middle of cell dark brown, the rest gray; a white streak through the cell, fading out before termen; an ocher dash below median vein and along vein 2. Hind wing gray. Expanse, 28 mm.

*Type.*—Male, No. 16520, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

### Genus ARGYRIA Hübner.

**ARGYRIA SUPPOSITA, new species.**

Silvery white; fore wing with yellow and brown costal edge, widened centrally, again subapically and cleft; termen with brown-black line, the fringe ocher; inner margin with yellow and brown edge, widened triangularly centrally. Head and dorsal stripe on thorax yellow-brown. Expanse, 20 mm.

*Cotypes.*—Three females, No. 16521, U.S.N.M.; Orizaba, Mexico (Schaus collection), and September, 1909 (R. Müller). Also one male, four females, Jalapa, Mexico (Schaus collection).

### Genus CRAMBUS Fabricius.

**CRAMBUS AUTOTOXELLUS, new species.**

Fore wing with vein 11 anastomosing with 12; hind wing with 4–5 shortly stalked, the outer margin slightly excavated below apex. Dark gray, submetallic; some black specks at base and about end of median vein; median and outer lines brown, curved, parallel; three black dots on the margin at middle and two white ones above; a terminal silver line seen in oblique light. Hind wing pale fuscous. Expanse, 21 mm.

*Cotypes.*—Two females, No. 18205, U.S.N.M.; Tehuacan, Mexico, September, 1913 (R. Müller).

### DEUTEROLIA, new genus.

Fore wing with vein 2 before the angle of the cell, 3 close to the angle, 4–5 stalked, 6 before apex of cell, 7–9 stalked, 10 and 11 on the cell, free. Hind wing with 2 near middle of cell, 3 before the angle, 4–5 stalked, 6 from apex of cell, far from 8, 7–8 stalked beyond cell. Palpi porrect, downcurved, extending twice the length of the head; front with a conical prominence. Fore wing with the apical area produced to a rounded prominence.

*Type of the genus.*—*Deuterolia nipis*, new species.

#### DEUTEROLIA NIPIS, new species.

Fore wing dark purplish gray; inner line beyond the middle, brown, curved, irregularly flexuous centrally; outer line near the margin; apex brown, cut off obliquely by the whitish, brown-edged upper segment of the outer line and crossed by a fine white line; margin below the incisure white with two black dashes, the line before it fine, white, dentate. Hind wing dark fuscous. Expanse, 22–24 mm.

*Cotypes.*—Two females, No. 18206, U.S.N.M.; Sierra de Guerrero, Mexico, July, 1913 (R. Müller).

### EUPAROLIA, new genus.

Fore wing with vein 2 near the middle of the cell, 3–5 stalked, 6 below the apex, 7–10 stalked, 11 curved, free. Hind wing with 2 near the middle of the cell, 3 shortly stalked with 4–5, the stem of 6 in the cell is far from 8, 6 arising above it but still remote from 8, 7–8 stalked beyond end of cell. Front with a conical prominence; fore wing with the apical area produced to a rounded prominence.

*Type of the genus.*—*Euparolia nipimidalis*, new species.

#### EUPAROLIA NIPIMIDALIS, new species.

Markings very much as in *D. nipis*, described above; outer line and apical white streak coarser; black spots on margin farther down near tornus. Expanse, 21 mm.

*Type.*—Female, No. 18207, U.S.N.M.; Sierra de Guerrero, Mexico, July, 1913 (R. Müller).

### Subfamily PYRALINAE.

### Genus MAPETA Walker.

#### MAPETA OMPHEPHORA, new species.

Fore wing broad, the apex rectangular; pale green with two whitish lines and the inner margin whitish; inner line straight, oblique; outer line curved, nearly touching the inner line on the margin; a small black discal dot. Hind wing orange ocher. Head and thorax green; abdomen orange-ocher. Expanse, 25 mm.

*Type.*—Female, No. 16519, U.S.N.M.; Zacualpan, Mexico, July, 1913 (R. Müller).

## Subfamily EPIPASCHIINAE.

### Genus POCOCERA Zeller.

**POCOCERA (WANDA) VANDELLA, new species.**

Fore wing dark gray; a line of raised black scales forming an oblique zigzag across wing; inner line oblique, whitish, straight, edged with black on both sides; a row of raised scales beyond it on costa; a short row in the lower part of the disk; outer line whitish, excurved mesially, edged with a subdentate black broken line within; a slender terminal black line, indistinctly broken on the veins. Hind wing pale yellowish in the male, with terminal dark line; slightly shaded with fuscous outwardly in the female. Expanse, 22 to 26 mm.

*Cotypes.*—Two males, four females, No. 15485, U.S.N.M.; Tehuacan, Mexico, July, 1912, August, 1910 and 1911, September, 1911 (R. Müller); Cerritos, San Luis Potosi, Mexico, August, 1911 (R. Müller).

Resembles *P. variella* Ragonot, but is larger and darker.

## Subfamily PHYCITINAE.

### Genus HOMALOPALPIA Dyar.

**HOMALOPALPIA EUTHALES, new species.**

Male antennæ with a notch in the side of the basal joint, the flagellum simple. Fore wing dark gray at the base, followed by a line of somewhat raised black scales; following area reddish to the oblique, broad, whitish inner line, straight except for a slight bend at submedian; a dark gray shade following, gradually paling to a whitish area about the double dark discal spot; apex dark, the outer line cutting it obliquely, pale, indistinct below. Hind wing translucent whitish without fuscous shade. Expanse, 18 mm.

*Type.*—Male, No. 16461, U.S.N.M.; Orizaba, Mexico (Schaus collection).

### Genus FUNDELLA Zeller.

**FUNDELLA AHEMORA, new species.**

Fore wing light gray, the lines whitish, obscure; the most conspicuous marking is the dark linings on the discal venules cut by the outer line; inner line strongly oblique, with an irregularity at median vein; cell pale, outlined by dark veins; terminal dots black, small. Hind wing translucent, soiled whitish, the fringe dark at apex; swollen area along inner margin sordid ocherous. Expanse, 11 mm.

*Type.*—Male, No. 16459, U.S.N.M.; Orizaba, Mexico (Schaus collection).

Larger than *pellucens* Zeller, more robust, the male with a large tuft of curved black hair on front side of fore tibia, entirely wanting in *pellucens*.

### Genus MYELOIS Hübner.

#### MYELOIS VENIPARS, new species.

Costa gray-white; inner area broadly pale brownish; inner line black, broad, curved a little and widening to median vein where it is sharply cut off and continued to margin by a faint brown shade; discal dots black, separate; median vein outwardly, with veins 2, 3, and 4, distinctly black-lined to outer line; a slight shade from cell down to margin near middle; outer line far out, in-angled opposite cell, double, pale filled, narrowly followed by black at costa; terminal space faintly blackish streaked on the veins; terminal dots small, distinct. Hind wing translucent soiled whitish, veins darker, margin fuscous shaded; fringe pale with faint dark interline. Expanse, male, 16 mm.; female, 19 mm.

*Cotypes.*—Male and female, No. 18208, U.S.N.M.; male, Oaxaca, Mexico (Schaus collection); female, Hermosillo, Mexico, bred from orange, November 2, 1913 (R. S. Woglum).

Sir G. F. Hampson has determined the male as *Myelois solitella* Zeller, but after studying Zeller's description and figure and Ragonot's redescription of that Colombian species, I feel satisfied that it is not the one before me. The present species is close to *M. transitella* Walker, but differs most in the dark lines on the discal nervules.

### Genus CABIMA Dyar.

#### CABIMA MOCHLOPHLEPS, new species.

Fore wing soft gray, the veins lined with black, most distinctly around the end of the cell and the veins close to their origins therefrom; an enlargement at base of veins 4–5 represents the discal spot; a brown shade through the center of the wing, cut off sharply and a little obliquely through the center of the cell; ordinary lines absent; subterminal line far from the margin, whitish, denticulate, slightly curved. Hind wing translucent whitish, the veins narrowly, costa and terminal line with its duplication in the fringe fuscous. Expanse, 30 mm.

*Type.*—Male, No. 18209, U.S.N.M.; Zacualpan, Mexico, August, 1913 (R. Müller).

### Genus MEGASIS Guenée.

#### MEGASIS PUNCTELLA, new species.

Light gray, slightly rufous through the cell; inner line of three distinct dots on costa, median and vein 1; outer line of numerous streaks on the veins, confluent at costa and followed there by whitish; discal dot faintly indicated. Hind wing broad, pale mouse gray, the long fringes concolorous, but a dark terminal line as on forewing. Expanse, 27 mm.

*Type.*—No. 16462, U.S.N.M.; Tehuacan, Mexico, September, 1911 (R. Müller).

Another specimen is labeled "*Zophodia inortella* Rag." in the handwriting of the late Herbert Druce, but this species can have no relation with Ragonot's *Zophodia inornatella*, as it differs markedly in venation, though somewhat similar superficially.

### Genus HYPSIPYLA Ragonot.

#### HYPSIPYLA CNABELLA, new species.

Similar to *H. grandella* Zeller, the markings less diversified, the veins simply and distinctly lined in black, not conspicuously blotched or streaked; outler line simple, pale, cutting the black veins, drawn in a little below vein 2, but not at all dentate; pale median area reduced nearly to obliteration, showing as slight yellow mottlings in submedian space; reddish area following indistinct; terminal dots nearly forming a line. Expanse, 32–34 mm.

*Cotypes.*—Three males, No. 16460, U.S.N.M.; Cordoba, Mexico, February, 1908 (F. Knab); Orizaba, Mexico, September, 1908 (R. Müller).

### MILDRIXIA, new genus.

Fore wing with veins 2 and 3 close together and parallel before the angle of the cell, 4–5 shortly stalked, 6 below angle of cell, 8–9 stalked, 10 free before the apex of the cell, 11 on the cell. Hind wing with the cell rather short, vein 2 before the angle, 3 and 5 long-stalked with 4, 3 joined to the stem for a considerable distance, 6 joined to 7–8, which anastomose, but leave 7 and 8 rather long and subparallel. Front with a large scaly tuft; labial palpi upturned above vertex, not appressed to the front; maxillary palpi simple, scaly. Male antennæ with long cilia in two rows, basal joint with two short projections, one vertical, one lateral. A subbasal scale-ridge on fore wing.

*Type of the genus.*—*Mildrixia constitutionella*, new species.

#### MILDRIXIA CONSTITUTIONELLA, new species.

Fore wing stone-gray, the subbasal scale ridge black, reaching to subcosta, preceded by a whitish line; an indistinct outward doubling dark shade; discal dots black, separated, the lower one followed by a little white, then some black scales; outer line denticulate, pale, dark edged on both sides; terminal dots subconfluent in the male. Hind wing whitish, pearly, translucent, costa and double terminal line gray. Expanse, 19–22 mm.

*Cotypes.*—Male and female, No. 16470, U.S.N.M.; Jalapa, Mexico (Schaus collection).

### PSEUDODIVONA, new genus.

Fore wing with veins 2 and 3 rather close and near the angle of the cell, 4–5 stalked, 6 below the upper angle, 8–10 stalked, 11 from the cell. Hind wing with vein 2 long before the angle of the cell, 3 nearly opposite the cross vein, separated from it, 4–5 long stalked, 6 from apex of cell, 7 anastomosing with 8 nearly to apex. Maxillary palpi thickly filiform, porrect, distinct; labial palpi densely scaly, porrect, slightly oblique, the third joint short, a little deflexed. Male antennæ smooth, ciliate.

*Type of the genus.*—*Pseudodivona commensella*, new species.

### PSEUDODIVONA COMMENSELLA, new species.

Fore wing with the costa grayish white, broadly; a vinous-black patch near base; inner area broadly vinous-brown, shaded nearly to median vein and vein 2, cut broadly by the inner line, which is of the pale ground color, and bent on submedian; a black bar on median vein beyond; veins outwardly dotted and streaked with black, cut by the outer line, faintly, except on costa, where the line is bordered with black on both sides; terminal dots large, nearly confluent. Hind wing pale grayish, semitranslucent, costa and veins darker. Expanse, 19–21 mm.

*Cotypes.*—Three males, No. 16463, U.S.N.M.; Jalapa and Orizaba, Mexico (Schaus collection).

Resembles *Zophodia dryopella* Schaus very closely in markings. One specimen is labeled "*Vitula edmandsii* Pack." in Sir G. F. Hampson's writing and on another is the same name in Mr. Schaus's hand; but this determination is extremely wild and must be due to some mistake.

## Genus ANCYLOSTOMIA Ragonot.

### ANCYLOSTOMIA ARGYROPHLEPS, new species.

Fore wing carneous white along costa, base of inner area and beyond cell; a broad band of red-brown shaded with blackish, from base to apex, through the cell; a broad area of the same color about tornus; a silvery line along median vein and base of vein 5 with one black dot at end of cell; traces of a similar marking on vein 1, with a dot; terminal dots black, minute; fringe red-purple. Hind wing whitish, the veins streaked with brown; termen shaded with fuscous in the female. Expanse, 20–24 mm.

*Cotypes.*—One male, two females, No. 16464, U.S.N.M.; Orizaba, Mexico (Schaus collection); Cuernevaca, Mexico, July, 1906 (W. Schaus); Orizaba, Mexico, August, 1911 (R. Müller).

## CACTOBROSIS, new genus.

Fore wing long and narrow; veins 2 and 3 before the end of the cell, 4 and 5 stalked, 6 below the apex of the cell, straight, 8 and 9 long-stalked, 10 and 11 on the cell. Hind wing with the cell reaching to the middle of the wing, vein 2 before its end, 4 absent, 3 and 5 stalked, 6 from the apex of the cell, 7 and 8 anastomosing, but well marked at apex. Labial palpi upturned, smooth, cylindrical, slightly angled by scales at the joints. Maxillary palpi small, filiform.

*Type of the genus.—Cactobrosis elongatella* Hampson.[1]

### KEY TO SPECIES.

Male antennæ pectinated .................................... *fernaldalis* Hulst.
Male antennæ serrate and fasciculate.
  Male smaller, gray, the fore wing with two pale lines ........ *elongatella* Hampson.
  Male larger, luteous on disk of fore wing, with large black spots on the veins, *maculifera* Dyar.

### CACTOBROSIS FERNALDALIS Hulst.

*Melitara fernaldalis* HULST, Trans. Amer. Ent. Soc., vol. 13, 1886, p. 163.
*Euzophera gigantella* RAGONOT, Nouv. Gen. Sp. Phyc. et Gall., 1888, p. 32.
*Honora cinerella* HULST, Journ. N. Y. Ent. Soc., vol. 8, 1901, p. 223.
*Melitara fernaldalis* DYAR, Proc. Ent. Soc. Wash., vol. 7, 1905, p. 36.

### CACTOBROSIS MACULIFERA, new species.

Fore wing gray with luteous tint over the submedian area; lines obsolete, broadly indicated by absence of black linings and powderings; irregular streaks on the veins except on termen, forming conspicuous spots in two rows across the wing on each side of the inner line area; a mark in end of cell, clouded; outer line entirely lost; some black streaks preceding its position. Hind wing translucent white. Expanse, 36 mm.

*Type.*—Male, No. 16465, U.S.N.M.; Oaxaca, Mexico (Schaus collection)

### CACTOBROSIS LONGIPENNELLA Hampson.

*Euzophera longipennella* DRUCE, Biol. Cent.-Amer., Lep. Het., vol. 2, 1896, p. 285 (*nomen nudum*).
*Euzophera longipennella* HAMPSON, Romanoff Mem., vol. 8, 1901, p. 52.

My specimens are exactly like the females of *elongatella* Hampson, only larger (*elongatella* female expands 30–32 mm.; *longipennella*, 35–39 mm.). The two names probably refer to one species, but males must be seen for certainty.

### CACTOBROSIS INSIGNATELLA, new species.

Fore wing soft gray without transverse black markings; the ordinary lines show as faintly paler shades, broad, diffuse, obscure, the outer showing a central stout tooth; veins slightly lined in blackish, the submedian fold rather conspicuously so. Hind wing whitish, with fuscous veins at apex, terminal line and line in the fringe. Expanse, 37–40 mm.

*Cotypes.*—Two females, No. 16466, U.S.N.M.; Oaxaca, Mexico (Schaus collection).

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[1] *Moodna elongatella* Hampson, Romanoff Mem., vol. 8, 1901, p. 269.

## Genus YOSEMITIA Ragonot.

### YOSEMITIA DIDACTICA, new species.

Fore wing gray, faintly carneous, the costal half white with longitudinal lines of black dustings; a streak near center of costa; discal dot single, black, rounded; outer line distinct, black, double, dentate, fainter below and parallel to the margin. Hind wing whitish, translucent, broadly pale gray shaded at the apex. Expanse, 20 mm.

*Cotypes.*—Male and female, No. 16467, U.S.N.M.; Tehuacan, Mexico, May and June, 1913 (R. Müller).

Near *Y. graciella* Hulst, but much more slender and delicate in build.

## Genus VITULA Ragonot.

### VITULA MALACELLA, new species.

Light gray, the costa white to the cell; discal dots blackish, faint; outer line slight, oblique, white, with gray edges, situated close to the margin; a purple-black line on basal third of costa, ending in a small angle with a tuft below. Hind wing whitish, gray on costa and termen. Expanse, 10 mm.

*Type.*—Male, No. 16468, U.S.N.M.; Tehuacan, Mexico. May, 1911 (R. Müller).

## MOODNOPSIS, new genus.

Venation of *Moodna* except that veins 8 and 9 of fore wing and 7 and 8 of hind wing are still distinct, not coincident. Hind wing with seven veins; 8–9 of fore wing stalked; 2 before angle of cell; labial palpi porrect; veins 4–5 of fore wing stalked; labial palpi slender, compressed, over twice as long as head; cell of hind wing moderate, less than half the length of the wing, veins 4 and 5 separate.

*Type of the genus.*—*Moodnopsis decipiens*, new species.

### MOODNOPSIS DECIPIENS, new species.

Dark gray, obscurely marked; a broad dark band for inner line, oblique, slightly irregular but indistinct; discal dot double, generally separated; outer line defined by interrupted dark streaks on the veins, itself of the ground color, the wing slightly tinged with purplish, especially outwardly; terminal dark powdering; fringe with a pale line at base. Hind wing pale fuscous, with dark terminal line and pale one at base of fringe; fringe gray. Expanse, 28 mm.

*Cotypes.*—Two females, No. 16469, U.S.N.M.; Orizaba, Mexico (Schaus collection).

The specimens were identified as *Ephestia kuehniella* Zellner, which I have also from Orizaba, but the resemblance is only superficial.

### Genus AURORA Ragonot.

**AURORA DIMIDIATELLA, new species.**

Fore wing gray-white on costal half, irrorated with darker, the inner half carneous gray; colors divided by a white line along median vein, edged with blackish below, especially in submedian fold, diffused and fading beyond vein 2. Hind wing pale fuscous tinted. Expanse, 21 mm.

*Type.*—Female, No. 16523, U.S.N.M.; Tehuacan, Mexico, September, 1912 (R. Müller).

### Genus BANDERA, Ragonot.

**BANDERA HOMIOTES, new species.**

Fore wing gray-white on costal half, whiter in the cell, the inner half carneous gray; colors divided by a white line along median vein, edged with black below along submedian fold as far as origin of vein 2. Hind wing pale fuscous. Expanse, 16 mm.

*Type.*—Female, No. 16524, U.S.N.M.; Oaxaca, Mexico (Schaus collection).

On one wing vein 5 is present, very short and close to the margin, but I regard this as an abnormality.

# LITTORAL MARINE MOLLUSKS OF CHINCOTEAGUE ISLAND, VIRGINIA.

By John B. Henderson and Paul Bartsch,
*Of the United States National Museum.*

## INTRODUCTION.

During July, 1913, the writers made a short trip to Chincoteague, on the Atlantic shore of Accomac County, Virginia, for the purpose of ascertaining the local marine fauna. Owing to the inaccessibility of this strip of coast, generally known as the "Eastern Shore," collectors seem to have neglected it. At all events, there appear to be but few records and no critical lists published of the shallow water shells from any locality between Cape May, New Jersey, and Beaufort, North Carolina. Our chief desire was to find out of just what elements the molluscan fauna consisted—to see how many, if any, species of southern range lapped over from Hatteras, and what northern species still persisted in this faunal area. We were happy in our somewhat haphazard choice of a locality for we encountered at Chincoteague a greater variety of stations than likely can be found at any other one point along this section of the coast. There are, first, the interior sounds of very considerable extent. These are very shallow (4 to 12 feet), more or less thickly sown with oyster beds and with patches of eel grass, the bottom ranging from hard sand through varying degrees of hard clay to soft mud. Second, we found the unusual feature of a bight or protected cove formed by the southward drift at the southern end of Assateague Island, protected from heavy wave action by a long, curved sand spit. This bight has a soft mud bottom, with a temperature possibly 8° less than that of the open sea. The mud which we brought up with the dredge seemed almost icy to the touch. This condition is probably produced by cold springs seeping through the floor of the bight. This colder water of the bight yielded to our dredge *Yoldia limatula*, large and fine, and *Nucula proxima*, whereas just around the protective spit of sand, on the ocean side, we found dead Terebras of two species, some young *Busycon perversa* and a valve of *Cardium robustum*, a somewhat startling association of species. Then, lastly, we had the open sea, which here presumably differs in no manner from other open-sea stations along the 200 miles or more of this coast. The bottom drops off very gradually to the edge of the continental shelf, some 75 or 100 miles out.

The open-sea stations we occupied were, as might be expected, very poor. The smooth, hard sand bottom seemed almost barren of life, and the softer patches that we explored contained only many dead shells—mostly small bivalves. We should admit, however, that our work in the open sea was scarcely a good test, although we made probably 20 hauls from the shore out some 4 or 5 miles, but the chart soundings indicated some more promising areas of pebbly bottom a few miles beyond what we considered the safety zone for a small motor boat.

The inner waters of the sound we found unexpectedly rich in molluscan life, the species, for the most part, not having been taken outside or in the bight.

We spent but two full working days, and were fortunate in securing an excellent boat and obliging skipper. The material has been identified with great care, all the critical species having been subjected to the most rigorous investigation. The following is the list of our catch:

## LIST OF SPECIES COLLECTED.

**OSTREA VIRGINICA Gmelin.**

**ANOMIA GLABRA Verrill.**

**PECTEN GIBBUS IRRADIANS Lamarck.**

**MYTILUS EDULIS Linnaeus.**

**SCAPHARCA TRANSVERSA Say.**

The typical as well as a varietal form occurs.

**SCAPHARCA CAMPECHENSIS PEXATA Say.**

Some specimens referable to the form *holmesii* Kurtz.

**ARCA (NOETIA) PONDEROSA Say.**

**NUCULA PROXIMA Say.**

Assateague Bight only.

**YOLDIA LIMATULA Say.**

Assateague Bight only. These specimens all show a tendency to turn up the pointed end, giving a slightly concave dorsal line from the beak to the anterior tip.

**LEDA ACUTA Conrad.**

**VENERICARDIA GRANULOSA Say=CARDITA BOREALIS Authors.**

**VENERICARDIA (PLEUROMERIS) TRIDENTATA Say.**

**ASTARTE CASTANEA Say.**

**CRASSATELLA (ERIPHYLA) LUNULATA Conrad.**

**DIVARICELLA QUADRISULCATA Orbigny.**

**PHACOIDES AURANTIA Deshayes.**

One valve on beach (adventitious ?).

**CARDIUM ROBUSTUM** Solander=**CARDIUM MAGNUM** Born.

**LÆVICARDIUM MORTONI** Conrad.

**VENUS MERCENARIA** Linnaeus.

**CHIONE CANCELLATA** Linnaeus.

**AGRIOPOMA CONVEXA** Say. **CYTHEREA CONVEXA** Say. **CALLOCARDIA MORRHUANA** Lindsay.

**PETRICOLA PHOLADIFORMIS** Lamarck.

**DONAX VARIABILIS** Say.

**TAGELUS GIBBUS** Spengler.

**TAGELUS DIVISUS** Spengler.

**ANGULUS TENERA** Say.

**PSAMMACOMA TENTA** Say.

Two fairly distinct forms of this occur which for the present may be called the southern and northern varieties.

**ABRA AEQUALIS** Say.

**SPISULA (HEMIMACTRA) SOLIDISSIMA** Dillwyn.

**SPISULA SOLIDISSIMA SIMILIS** Say.

**SPISULA SOLIDISSIMA RAVENELI** Conrad.

**MULINIA LATERALIS** Say.

**LABIOSA (RAETA) CANALICULATA** Say.

**LYONSIA HYALINA** Conrad.

**CORBULA CONTRACTA** Say.

**MYA ARENARIA** Linnaeus.

**ENSIS MINOR** Dall.

**PHOLAS (BARNEA) COSTATUS** Linnaeus.

**TORNATINA CANALICULATA** Say.

**CYLICHNELLA BIPLICATA** H. C. Lee.

Not *C. bidentata* Orbigny, generally accepted as synonomous.

**TEREBRA CONCAVA** Say.

**TEREBRA DISLOCATA** Say.

**CLATHURELLA JEWETTI** Stearns (typical).

**MANGILIA, CERINA** Kurtz and Stimpson.

**MANGILIA,** species.

A single specimen of what will probably prove to be a new species was found on the beach at Assateague Bight. This shell is too worn to be properly described.

**MARGINELLA APICINA BOREALIS** Verrill.

**FULGUR PERVERSA** Linnaeus.

Very young specimens only.

**FULGUR CARICA** Linnaeus.

**SYCOTYPUS CANALICULATUS** Say.

**TRITIA TRIVITTATA** Say.

**NASSA OBSOLETA** Say.

**NASSA VIBEX** Say.

Exceptionally large race.

**COLUMBELLA (ANACHIS) AVARA** Say (typical).

Large, solid, dingy colored, with 10 to 12 prominent ribs.

**COLUMBELLA (ASTYRIS) LUNATA** Say.

Specimens from the same haul of the dredge vary greatly in color patterns from light with dark maculations to dark with light maculations to solid reddish brown; the latter is suggestive of Stimpson's

*C. dissimilis*. It seems useless to attempt any divisions into subspecies based upon color characters only.

**EUPLEURA CAUDATA Say.**

Exceptionally large.

**UROSALPINX CINEREUS Say.**

The enormous size of our specimens taken from the oyster beds at first led us to suspect a new species. Say's type, however, came from the Maryland shore and is much larger than the shells of this species from either north or south of this region. These, then, are probably typical *cinereus* and specimens from Long Island as well as those from Hatteras south belong to a much smaller race. Some of our shells measure 51.5 mm. long by 26.4 diameter, while the general average is not very much less. A few specimens (dead) dredged in the open sea are of the smaller race generally known to collectors (20.8 mm. long by 11.4 mm).

### EPITONIUM VIRGINICUM, new species.

Plate 13, fig. 1.

Shell very small, broadly conic, white. Nuclear whorls 4, well rounded, polished, separated by a strongly impressed suture. Postnuclear whorls inflated, marked by very slender lamellar, retractive axial ribs, of which 36 occur upon the first, 48 upon the second, and 60 upon the last turn. The spaces between the axial ribs are a little more than twice as wide as the ribs, and are crossed by very fine spiral threads which run up on the sides of the ribs but do not cross their summit. Of these spiral threads about 20 occur between the sutures on the middle whorl. These threads are about one-half as wide as the spaces that separate them, and are a little more closely spaced at the summit than on the middle of the whorls. Suture strongly constricted. Periphery of the last whorl well rounded. Base well rounded, marked by the continuations of the axial ribs, which extend undiminished to the umbilical region, where they approach each other to such an extent that they become almost fused. Aperture very broadly and very regularly oval; outer lip thin, showing the external sculpture within; inner lip appressed to the body whorl, evenly curved; parietal wall covered with a thick yellowish callus.

The type, Cat. No. 252568, U.S.N.M., was dredged at Chincoteague, Virginia. It has a trifle more than three post-nuclear whorls, and measures: Length, 3 mm.; diameter, 1½ mm.

This little gem appears to be a full-grown individual, judging by the slight thickening of the lip.

**EPITONIUM SAYANA Dall,**

**EPITONIUM LINEATA Say,**

**EPITONIUM MULTISTRIATA Say,**

**MELANELLA OLEACEA Kurtz and Stimpson—"EULIMA OLEACEA" Kurtz and Stimpson.**

### TURBONILLA (PYRGISCUS) POWHATANI, new species.

Plate 13, fig. 5.

Shell broadly conic, yellowish white. Nuclear whorls decollated. Post-nuclear whorls moderately well rounded, feebly shouldered at the summit, marked by strong, almost vertical axial ribs, of which 22 occur upon the third, 24 upon the fourth, 26 upon the fifth and seventh, and 28 upon the penultimate turn. These ribs are almost as wide as the spaces that separate them. Intercostal spaces crossed by 7 equal and equally spaced, strongly incised spiral lines. Suture strongly marked. Periphery of the last whorl well rounded. Base short, well rounded, marked by the continuations of the axial ribs, which extend to the umbilical chink, and 5 or 6 feebly incised, irregularly spaced spiral lines. Aperture oval; posterior angle acute; outer lip thin, showing the external sculpture within by transmitted light; inner lip somewhat twisted, slightly revolute; parietal wall covered with a moderately thick callus.

The type, Cat. No. 252574, U.S.N.M., was dredged at Chincoteague, Virginia. It has 7½ post-nuclear whorls, and measures: Length, 5 mm.; diameter, 1.8 mm.

### TURBONILLA (PYRGISCUS) POCAHONTASAE, new species.

Plate 14, fig. 4.

Shell broadly conic, bluish white. Nuclear whorls 2½, forming a depressed helicoid spire, the axis of which is almost at right angles to the axis of the succeeding turns, in the first of which it is partly immersed. Post-nuclear whorls very slightly rounded, moderately shouldered at the summit, marked by strong, slightly protractive, broad, well rounded, somewhat curved axial ribs, of which 18 occur upon all the whorls. The intercostal spaces are about twice as broad as the axial ribs. They are well rounded and shallow. They are marked by 5 broad spiral grooves and a number of fine incised lines. The space between the summit and the first broad groove is about twice as wide as that between any of the grooves. This space is crossed by 6 fine incised spiral lines, which are not quite equally spaced, the second and third and the fourth and fifth being a little closer to each other than the others. The space between the first broad groove and the second is crossed by a strongly incised fine spiral line, and the space between the third and fourth is likewise crossed by a fine incised line. Suture well impressed. Periphery of the last whorl feebly angulated, marking the termination of the axial ribs. Base very short, well rounded, marked by 19 well-incised fine spiral lines, which grow successively closer spaced from the periphery to the umbilical area. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within;

inner lip almost vertical, slightly revolute; parietal wall glazed with a thin callus.

The type, Cat. No. 252575 U.S.N.M., was dredged at Chincoteague, Virginia. It has 10 post-nuclear whorls, and measures: Length, 5.7 mm.; diameter, 1.8 mm.

### TURBONILLA (PYRGISCUS) TOYATANI, new species.

Plate 14, fig. 5.

Shell broadly conic, wax yellow. Nuclear whorls decollated. Postnuclear whorls appressed at the summit, marked by almost vertical axial ribs, which are about two-thirds as broad as the spaces that separate them. Of these ribs 22 occur upon all but the last turn, which has 24. Intercostal spaces marked by 6 equal and equally spaced, rather broad, deeply incised spiral lines, the first of which is about 1½ times as far anterior to the summit of the whorls as it is separated from the second, and three very fine lines. Two of these fine spiral lines occur between the summit and the first deeply incised line, while the third occurs halfway between the first and second deep spirals. Suture well marked. Periphery of the last whorl feebly angulated, marking the termination of the axial ribs, which become evanescent here. Base moderately long, well rounded, marked by 13 incised spiral lines of somewhat varying strength and irregular distribution. The space between the first of these lines and the first line of pits on the spire is wider than any of the spaces between the strongly incised lines of the spire. Aperture ovate; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip oblique, slightly curved, and somewhat reflected; parietal wall covered with a thin callus.

The type, Cat. No. 252572, U.S.N.M., was dredged at Chincoteague, Virginia. It has 10 post-nuclear whorls, and measures: Length, 5.3 mm.; diameter, 1.5 mm.

### TURBONILLA (PYRGISCUS) VIRGINICA, new species.

Plate 13, fig. 4.

Shell elongate-conic, wax yellow with a darker golden yellow band, which occupies the space bounded by the third and fourth incised spiral grooves. Nuclear whorls decollated, the 3 succeeding badly worn, the remainder well rounded, ornamented with retractive, rounded, moderately strong, axial ribs, which are about two-thirds as broad as the spaces that separate them. Of these ribs 22 occur upon the fourth and fifth, 26 upon the sixth, and 28 upon the penultimate whorl. In addition to the axial sculpture, the whorls are marked by 5 equal and almost equally spaced, strongly incised spiral lines, the first one of which is at a little greater distance below the summit than the space which separates the first and second incised lines. The space between the summit and the first incised line is crossed by 3 very fine equal and equally spaced spiral striations. The incised lines pass up on the sides of the ribs but do not cross the summit. In addition to the above sculpture, the entire surface of the shell is marked with microscopic lines of growth and spiral striations. Suture strongly impressed. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by the continuations of the axial ribs, which disappear shortly after passing the periphery, and 15 incised spiral lines of somewhat varying width. There is a plain band between the fifth spiral line of the spire and the first incised line of the base a little broader than the band at the summit. Aperture ovate; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip thin, somewhat sigmoid, and slightly revolute; parietal wall covered with a thin callus.

The type, Cat. No. 252573, U.S.N.M., was dredged at Chincoteague, Virginia. It has 8 post-nuclear whorls, having lost the nucleus and probably the first post-nuclear turn, and measures: Length, 4.2 mm.; diameter, 1.4 mm.

Another specimen, in not quite as good condition as the type, has 9 post-nuclear whorls, and measures: Length, 6.2 mm.; diameter, 1.7 mm.

**TURBONILLA (PYRGISCUS), species?**

A specimen apparently of an undescribed species, but too poor to serve for description.

**TURBONILLA (PYRGISCUS), species?**

The above remarks apply also here.

### ODOSTOMIA (CHRYSALLIDA) TOYATANI, new species.

Plate 13, fig. 2.

Shell small, elongate-ovate, bluish white. Nuclear whorls obliquely immersed in the first of the succeeding turns, above which only half of the last volution projects. Post-nuclear whorls feebly rounded, shouldered at the summit, marked by somewhat retractive axial ribs, which are about as broad as the spaces that separate them. Of these ribs, 20 occur upon the first, 22 upon the second and third, and 24 upon the last turn. In addition to the axial ribs, the whorls are crossed by 4 spiral cords which equal the axial ribs in strength and render the junction of the axial ribs and the spiral cords nodulous. The first of these cords is at the summit, and the fourth bounds the peripheral sulcus. The spaces inclosed between the axial ribs and the spiral cords are strongly impressed, rectangular pits, having the long axis parallel with the spiral sculpture. Suture channeled. Periphery of the last whorl marked by a strong sulcus. Base moderately long, slightly umbilicated, marked by 9 spiral cords, which diminish regularly in size from the peripheral sulcus to the umbilical region. Aperture oval; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip curved and somewhat revolute, adnate posteriorly to the base; parietal wall glazed with a moderately thick callus.

The two specimens of this species, Cat. No. 252578, U.S.N.M., were dredged at Chincoteague Bay, Virginia. One of these, the type, has 5 postnuclear whorls, and measure: Length, 2.2 mm.; diameter, 1 mm.

### ODOSTOMIA (CHRYSALLIDA), species?

A specimen which we are unable to refer to any of the known forms, but which is too poor to serve as type for a new species.

### ODOSTOMIA (MENESTHO) IMPRESSA Say.

Two specimens.

### ODOSTOMIA (EVALEA) VIRGINICA, new species.

Plate 13, fig. 3.

Shell small, elongate-conic, bluish white, with a narrow pale yellow band a little anterior to the summit. Nuclear whorls decidedly obliquely immersed in the first of the succeeding turns, above which the tilted edge of the last volution only projects. Post-nuclear whorls moderately well rounded, weakly shouldered at the summit, marked by decidedly retractive lines of growth and exceedingly fine spiral striations. A slender spiral thread is situated a little posterior to the suture, forming a slight angulation from which the whorls bend a little more abruptly to the inferior tuture. Suture strongly impressed, base of the last whorl moderately long, somewhat inflated, strongly rounded and openly umbilicated. Aperture oval; posterior angle obtuse; outer lip thin; inner lip decidedly oblique, curved and somewhat revolute; parietal wall glazed with a thin callus.

The type and 4 specimens were dredged at Chincoteague, Virginia.

The type, Cat. No. 252576, U.S.N.M., has 6 post-nuclear whorls and measures: Length, 2.7 mm.; diameter, 1.2 mm.

### ODOSTOMIA (EVALEA) POCAHONTASAE, new species.

Plate 13, fig. 6.

Shell small, quite regularly conic, semitranslucent, bluish white, with a narrow pale yellow band a little anterior to the summit. Nuclear whorls obliquely immersed in the first of the succeeding turns, above which the titled edge of the last volution only projects. Post-nuclear whorls flattened, feebly shouldered at the summit, the sides of the succeeding turns forming a perfectly straight line, marked by exceedingly fine protractive lines of growth, and microscopic spiral striations only. Suture rendered slightly channeled by the weak shoulder at the summit of the whorls. Periphery of the last whorl decidedly angulated. Base short, well rounded, narrowly umbilicated, marked by lines of growth and fine spiral striations. Aperture ovate; posterior angle acute; outer lip thin; inner lip slightly curved and somewhat revolute, provided with a strong, oblique fold at its posterior extremity; parietal wall glazed with a thin callus.

The type, Cat. No. 252577, U.S.N.M., has 7 post-nuclear whorls and measures: Length, 2.4 mm.; diameter, 1 mm., and it was dredged at Chincoteague Bay, Virginia.

### TRIPHORIS PYRRHA, new species.

Plate 14, fig. 1.

Shell broadly conic, white. Nuclear whorls 4, the first half of the first turn smooth, the rest marked by 2 spiral cords and numerous very fine axial threads. Post-nuclear whorls well rounded, the first 4 marked with 2 tuberculated spiral cords, of which one is immediately below the summit and the other a little posterior to the periphery. Beginning with the fifth whorl a third spiral thread makes its appearance between the two, and on the last turn attains a size equal to the one posterior to the periphery. In addition to the spiral cords, weak axial riblets are present, which render the spiral cords tuberculated, 16 tubercles appearing on the first and second whorl, 18 upon the third and fourth, 20 upon the remaining. Suture somewhat channeled. Periphery of the last whorl marked by a strong spiral cord, which is separated from the supraperipheral spiral cord by a sulcus as wide as that which separates the supraperipheral cord from the median. This sulcus is crossed by the continuations of the axial riblets, which stop at its posterior margin. Base moderately produced, marked by two spiral cords, one at the insertion of the columella and the other halfway between this and the peripheral cord. Aperture irregular, decidedly channeled anteriorly (outer lip fractured, thin); inner lip appressed to the base, and fused with the heavy callus which covers the parietal wall and renders the peritreme complete.

The type, Cat. No. 252571, U.S.N.M., was dredged at Chincoteague. It has 7 post-nuclear whorls, and measures: Length, 2.7 mm.; diameter, 0.9 mm.

### TRIPHORIS NIGROCINCTA C. B. Adams.

### DIASTOMA VIRGINICA, new species.

Plate 14, fig. 3.

Shell elongate-conic. The early whorls are chestnut brown, the succeeding turns flesh colored, mottled and variegated with brown; in some specimens the chestnut brown extends over the entire shell. Nuclear whorls two and one-half, well rounded, smooth. The first 3 post-nuclear whorls rather well rounded; the succeeding turns less so, while the later ones are almost flat. The whorls are marked with poorly developed axial ribs which are almost obsolete on the early turns, where they are merely indicated. Of these ribs, 14 occur upon the third and fourth, 16 upon the fifth, 18 upon the sixth, and 20 upon the remaining turns. The intercostal spaces are fully twice as broad as the ribs, and are crossed by 4 low spiral bands between the sutures, which are a little wider than the spaces that separate them, rendering the axial ribs feebly nodulous at the junction with the ribs. On the last 2 turns the second spiral cord below the summit splits, thus forming 5 spiral cords on these whorls. Beginning with the fifth whorl the cord anterior to the periphery makes its appearance in the suture as a small spiral band, becoming more and more exposed in the succeeding turns. The spaces inclosed between the the axial ribs and the spiral cords are shallow, impressed, squarish pits on the middle whorls, and elongate pits having their long diameter parallel with the spiral sculpture, on the early turns and the last 2 whorls. Suture moderately impressed. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by the feeble continuations of the axial ribs and 9 spiral cords, which grow successively narrower from the periphery to the umbilical area. These cords are separated by grooves about half as wide as the cords. A strong varix, forming a decided callus, is present diametrically opposite the aperture on the last turn. The spiral cords, preceding and extending partly upon this callus, are tinged with dark chestnut brown. Aperture decidedly patulus, ear shaped, slightly channeled posteriorly and decidedly anteriorly; outer lip thin, decidedly expanded, evenly rounded, flesh colored with a checkerboard pattern of brown, when viewed by transmitted light, which is formed by squarish brown spots marking the intercostal portion of the spiral cords; inner lip reflected, somewhat sigmoid; parietal wall covered by a thick callus, rendering the peritreme complete.

The type, Cat. No. 252569, U.S.N.M., and about 2,000 specimens were collected on the eel grass at Chincoteague Bay. The type has 11 whorls, and measures: Length, 8.3 mm.; diameter at the aperture, 3 mm.; and 2.2 mm. at the antepenultimate whorl.

There are several species of Diastoma tied up under the names of *Bittium nigrum* Totten, and *Diastoma varium* Pfeiffer. It would be out of place in the present paper to discuss this subject at length, as it is to be dealt with shortly in a forthcoming monograph upon these small shells by Dr. Paul Bartsch, in which the synonymy as well as the systematic relationship of these shells will be completely discussed. The present species is more nearly related to *Diastoma varium* Pfeiffer, a truly West Indian species, than it is to the mollusk which has been known to us under that name from the shores of the South Atlantic States.

**CERITHIOPSIS (CERITHIOPSIS) VIRGINICA, new species.**

Plate 14, fig. 2.

Shell minute, dark chestnut brown, except the apex, which is yellowish white. Nuclear whorls 4, well rounded, smooth. Post-nuclear whorls well rounded, marked by strong axial ribs, of which 16 occur upon all the whorls but the last, which has 18. In addition to the axial ribs, the whorls are marked by 3 strong spiral cords of which the first, which is a little less strong than the rest, is at the summit. The junctions of the axial ribs and the spiral cords form strong tubercles, which are slightly elongate on the first two cords below the summit, while on the last cord they are truncated posteriorly, sloping gently anteriorly. The spaces inclosed between the spiral cords and the axial ribs are rectangular pits on all the whorls but the last; on which they are well rounded. Suture strongly constricted. Periphery of the last whorl marked by a strong somewhat flattened keel, to which the axial ribs extend. Base moderately produced, marked by two spiral cords, one at the insertion of the columella, and another halfway between this and the peripheral cord. Aperture irregular, decidedly channeled anteriorly; posterior angle acute; outer lip thin, showing the external sculpture within.

The type, Cat. No. 252570, U.S.N.M., was dredged on eel grass in the Bay at Chincoteague, Virginia. It has 6 post-nuclear whorls, and measures: Length, 2.9 mm.; diameter, 1 mm.

**LITTORINA IRRORATA Say.**

**CREPIDULA FORNICATA Linnaeus.**

**CREPIDULA CONVEXA Say.**

**CREPIDULA PLANA Say.**

**NATICA PUSILLA Say.**

**POLYNICES HEROS Say.**

**POLYNICES DUPLICATA Say.**

**SIGARETUS PERSPECTIVUS Say.**

**FISSURELLA ALTERNATA Say.**

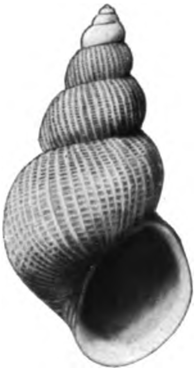
## EXPLANATION OF PLATES.

### PLATE 13.

Fig. 1. *Epitonium virginicum*, new species, type 3 mm.
2. *Odostomia (Chrysallida) toyatani*, new species, type 2.2 mm.
3. *Odostomia (Evalea) virginica*, new species, type 2.7 mm.
4. *Turbonilla (Pyrgiscus) virginica*, new species, type 4.2 mm.
5. *Turbonilla (Pyrgiscus) powhatani*, new species, type 5 mm.
6. *Odostomia (Evalea) pocahontasae*, new species, type 2.4 mm.

### PLATE 14.

Fig. 1. *Triphoris pyrrha*, new species, type 2.7 mm.
2. *Cerithiopsis (Cerithiopsis) virginica*, new species, type 2.9 mm.
3. *Diastoma virginica*, new species, type 8.3 mm.
4. *Turbonilla (Pyrgiscus) pocahontasae*, new species, type 5.7 mm.
5. *Turbonilla (Pyrgiscus) toyatani*, new species, type 5.3 mm.



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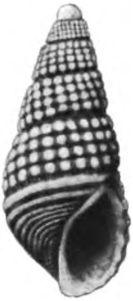

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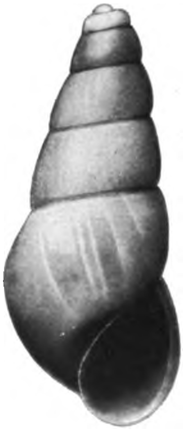

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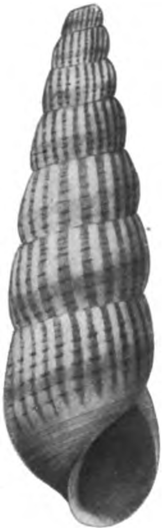

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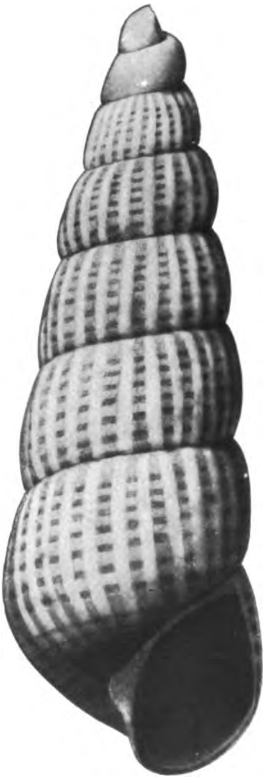

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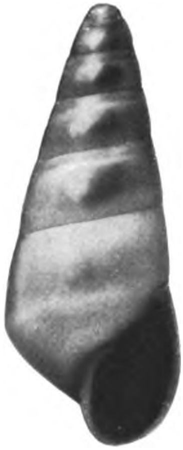

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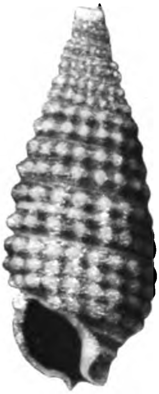
MOLLUSKS OF CHINCOTEAGUE, VA.

FOR EXPLANATION OF PLATE SEE PAGE 421.



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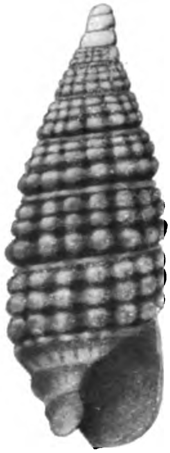

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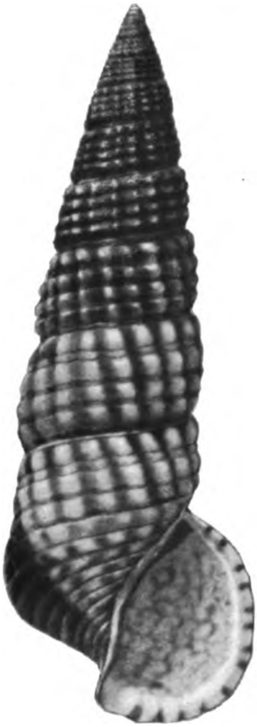

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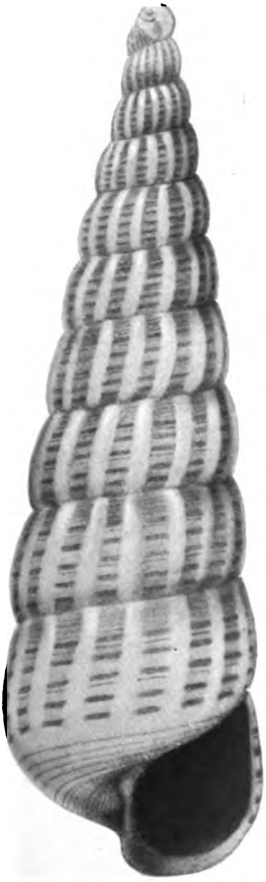

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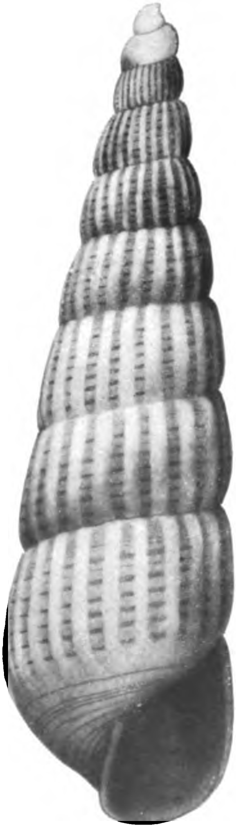

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MOLLUSKS OF CHINCOTEAGUE, VA.

FOR EXPLANATION OF PLATE SEE PAGE 421.

# LEPIDOPTERA OF THE YALE-DOMINICAN EXPEDITION OF 1913.

By HARRISON G. DYAR,
*Custodian of Lepidoptera, United States National Museum.*

A list of Dominican Lepidoptera was published many years ago by Godman and Salvin and Herbert Druce.[1] The present list adds some species, but others already reported are missing from this collection. All the specimens were taken by H. W. Foote, either in June and July, 1913, or without definite data. The data are therefore omitted under the specific headings. The names of the species are followed by the number of specimens taken..

## PAPILIONOIDEA.

**DANAIS PLEXIPPUS Linnaeus.** 1.

**COLAENIS CILLENE Cramer.** 5.

**AGRAULIS VANILLAE Linnaeus.**

**JUNONIA COENIA Hübner.** 4.

**ANARTIA JATROPHAE Linnaeus.**

**DIDONIS BIBLIS Fabricius.** 1.

**LYCAENA HANNO Stoll.** 4.

**LYCAENA CASSIUS Cramer.** 2.

**THECLA SALONA Hewitson.** 2.

**THECLA OTOHEBA, new species.**

Brownish black; anal angle of hind wing red, with a white speck; tail at vein 2 long, at 3 short, both white-tipped. Beneath browngray; fore wing with slightly oblique brown band from costa to vein 2 and an irregularly tremulous submarginal one across the wing. Hind wing with a mesial dark crimson band, dislocated at vein 4, arcuate between 2 and 1b, retreating to inner margin, edged outwardly with silvery white arcs between the veins; an irregular blackish subterminal line, dentate on the veins, followed by red from inner margin to vein 4, looped up between 2 and 4 for a large red patch; a large black spot at anal angle and interspace 2–3, small ones between 3 and 7, a black, blue-powdered area between 1b and 2; a black terminal line preceded by silvery white. Expanse, 21 mm.

*Cotypes.*—Two females, No. 18055, U.S.N.M.; Dominica, June-July, 1913 (H. W. Foote).

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[1] Proceedings of the Zoological Society of London, 1884, pp. 314 to 326.

PROCEEDINGS U. S. NATIONAL MUSEUM, VOL. 47—NO. 2056.

**TERIAS DEBA Doubleday.** 10.

**TERIAS EUTERPE Ménétriés.** 1.

**CALLIDRYAS EUBULE Linnaeus.** 5.

**CALLIDRYAS TRITE Linnaeus.** 2.

**PAPILIO POLYDAMAS DOMINICUS Rothschild and Jordan.** 1.

**CATIA RAVOLA Godman and Salvin.** 14.

**HYLEPHILA PHYLAEUS Drury.** 4.

**PROTEIDES ANGASI Godman and Salvin.** 2.

**PYRGUS SYRICHTUS Fabricius.** 1.

**ACOLASTUS AMYNTAS Fabricius.** 6.

**EUDAMUS SANTIAGO Lucas, variety.** 9.

**PRENES NERO Fabricius.** 2.

**PRENES ARES Felder.** 2.

The markings of the under side are fainter than usual and blurred with brown.

**EANTIS THRASO Hübner.** 1.

## SPHINGOIDEA.

**PROTOPARCE JAMAICENSIS Butler.** 1.

## BOMBYCOIDEA.

**SYNTOMEIDA SYNTOMOIDES Boisduval.** 1.

**COSMOSOMA DEMANTRIA Druce.** 2.

**ECPANTHERIA ERIDANUS Cramer.** 2.

**UTETHEISA ORNATRIX Linnaeus.** 3.

**AMASTUS ALSA Druce.** 1.

**RIFARGIA CHOCOTOA, new species.**

Dark brown, the lines coarsely wavy, black; subbasal doubled, the inner irregularly triple, the outer followed by a duplicating shade with black dashes on the veins and preceded by a somewhat distant line; subterminal line whitish, a little stronger at costa; terminal line fine, black, forming black streaks between the veins, cut by yellowish dashes, the black marks seeming to be followed by pale instead of preceded, as in most *Rifargia;* discal markings slight, a little pale, followed by a cloud. Hind wing black-brown, palest at base; fringe yellowish white. Expanse, 60 mm.

*Cotypes.*—Two females, No. 16056, U.S.N.M.; Dominica, June-July, 1913 (H. W. Foote).

Nearest to *R. tethys* Schaus.

**LYCOPHOTIA INFECTA Ochsenheimer.** 2.

**ERIOPYGA VESQUESA Dyar.** 1.

**PRODENIA DOLICHOS Fabricius.** 1.

**XYLOMYGES ERIDANIA Cramer.** 1.

**HETEROCHROMA POSTALBIDA, new species.**

Brown, a little mottled with blackish; reniform, orbicular and claviform large, contiguous, black outlined, the orbicular and reniform partly pale creamy filled; lines scarcely traceable, single, the outer excurved over disk and submedian; subterminal line pale, wavy and irregular, crossed by several black streaks on the interspaces; a black streak prolonging claviform to the outer line; a black shade from base near the inner margin to inner line. Hind wing white; veins fuscous outwardly; a narrow dark marginal border. Expanse, 17–18 mm.

*Cotypes.*—Two males, No. 18057, U.S.N.M.; Dominica (H. W. Foote).

**CYDOSIA SUBMUTATA Walker.** 1.

**EULEPIDOTIS ADDENS Walker.** 1.

**REMIGIA MEGAS Guenée.** 2.

**REMIGIA LATIPES Guenée.** 3.

**PHURYS IMMUNIS Guenée.** 2.

**LETIS MYCERINA Fabricius.** 1.

**MELIPOTIS CONTORTA Guenée.** 2.

**ANTICARSIA REPUGNANS Hübner.** 1.

*A. ferruginea* Smith[1] is a synonym.

**ZETHES UMBRATA Walker.** 1.

**ARGADESA APTA Moore.** 1.

**PANULA INCONSTANS Guenée.** 1.

**GONODONTA ELABORANS, new species.**

Fore wing bronzy brown, anal angle yellow brown; two parallel brown streaks arising from the subbasal tooth; subterminal line fine, crenulate, dark brown, obscure, violet-white powdered without, approaching the margin at vein 2. Hind wing black, with a small round orange patch on the discal nervules. Front of head and palpi within whitish. Expanse, 37 mm.

*Type.*—Male, No. 18058, U.S.N.M.; Dominica (H. W. Foote).

**NEPHELOLEUCA ATOMARIA, new subspecies.**

A form of *politia* Cramer with the costo-subapical patch small, narrow, broken into strigæ, not rounded or whitish filled.

*Cotypes.*—Four females, No. 18059, U.S.N.M.; Dominica, June–July, 1913 (H. W. Foote).

**MELANCHROIA CEPHISE Cramer.** 2.

**TEPHROSIA MADEFACTARIA, new species.**

Wings pale brownish, all beyond the outer line overspread with brown and black, except a small square patch below apex; sparsely dotted; inner line fine, black, waved, curved, accompanied by a little shading; median shade moderate, touching the small round discal dot; outer line irregular, excurved between veins 4 and 2; subterminal line of whitish dots. Hind wing similar, without the inner line or pale apical spot, the outer line nearly straight. Expanse, 39 mm.

*Type.*—Female, No. 18060, U.S.N.M.; Dominica, June–July, 1913 (H. W. Foote).

**PERICLINIA TRIATRAPATA, new species.**

Reddish brown with purplish strigæ, dense along the costa; two thick straight purple brown lines on fore wing, scarcely diverging toward costa, one on hind wing, very little curved; a round blackish discal dot on each wing. Expanse, 31 mm.

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[1] Bull. 52, U. S. Nat. Mus., No. 2049.

*Type.*—Male, No. 18061, U.S.N.M.; Dominica, June–July, 1913 (H. W. Foote).

**PERICLINA TRANSMIGRATA, new species.**

Bright red-brown, peppered, faint blackish strigæ along costa and apex; two parallel straight pale reddish lines, one on the hind wing; a minute black discal dot on fore wing. Expanse, 32 mm.

*Type.*—Female, No. 18062, U.S.N.M.; Dominica, June–July, 1913 (H. W. Foote).

## TINEOIDEA.

**GLYPHODES HYALINATA** Linnaeus. 1.

**GLYPHODES ELEGANS** Möschler. 1.

**SYLEPTA SIMMIALIS** Walker. 1.

**PHRYGANODES PROLONGALIS** Guenée. 1.

**SPARGAMIA GIGANTALIS** Guenée.

**ATTEVA PUNCTELLA** Cramer. 1.

# A SYSTEMATIC ACCOUNT OF THE GRASSHOPPER MICE.

By N. Hollister,

*Assistant Curator, Division of Mammals, United States National Museum.*

## INTRODUCTION.

The nomenclatorial history of the Grasshopper Mice, or Scorpion Mice, begins with 1841, when Maximilian, Prince of Wied, in his Reise in das innere Nord-America, described *Hypudaeus leucogaster* from what is now the State of North Dakota. Coues, in the Monographs of North American Rodentia, 1877, recognized two species, *Hesperomys* (*Onychomys*) *leucogaster* (Maximilian) and *Hesperomys* (*Onychomys*) *torridus* Coues. The only definite synopsis of the group since that date was published by Merriam in 1889.[1] In this paper *Onychomys* was for the first time properly diagnosed and given full generic rank. Four species and one subspecies were recognized. The latest list of North American mammals,[2] published in 1912, includes 19 named forms, 11 of which stand as full species. Four subspecies have since been described.

In the present revision of the genus two names are placed in synonymy, one is revived and one new subspecies is described. These changes leave the total number of recognized forms at 23, a net increase of 4 since 1912. While the number of races has been increased, the number of actual species has been reduced to two, the *leucogaster* and *torridus* of Coues's report of 1877. Such changes appear to be the inevitable result of study of the magnificent series of American mammals now preserved in our museums, particularly the collection of the Biological Survey. With a suite of specimens such as these collections afford, direct intergradation between many supposedly distinct species is apparent, and with the increase in the number of geographical races a decrease in the number of recognizable species is to be expected.

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[1] North Amer. Fauna, No. 2, pp. 1-5. Oct. 30, 1889.

[2] Miller, Bull. 79, U. S. Nat. Mus., pp. 126-129. Dec. 31, 1912.

This revision of *Onychomys* is the result of the study of 1,562 specimens,[1] almost all of which have been modern well-made skins with perfect skulls. A few alcoholic specimens and skeletons have been examined. Except in a few cases the material has been sufficient to work out the ranges of the subspecies in a fairly satisfactory manner, though good series of specimens, including a sufficient number of adults, from certain regions, will modify somewhat the boundary lines between forms as at present mapped. All of the 23 existing type-specimens have been examined.

## FORMS, CHARACTERS, AND PELAGES.

One of the results of the reduction in the number of distinct species to two, and the increase in the number of geographical races of each of these, is the increased difficulty in finding hard and fast, easily defined, conspicuous characters to diagnose these two species. While the two groups of subspecies as two specific units occupy an immense range, one to the north and one to the south, the actual area of overlapping is small.[2] At these points of overlapping, where intergradation could, but does not, take place, the two species are well differentiated externally, there is never the least doubt concerning the species to which a specimen belongs, and a working key to the species in this overlapping area could be made on a great number of simple differences, both external and cranial. Since all the numerous and widely diversified forms have been found to intergrade indirectly with either *leucogaster* or *torridus*, however, all of the superficial characters which hold good to identify the species at the few overlapping points fail with some far removed form, which, although intergrading indirectly with only one of the early named species, may really resemble in any one or any combination of such characters some race of the other species with which it has no real conspecific relationship. The teeth present the best characters by

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[1] The material examined is from collections as follows:

| | |
|---|---|
| United States National Museum, Biological Survey collection | 1,041 |
| United States National Museum proper | 163 |
| American Museum of Natural History, New York | 118 |
| Museum of Vertebrate Zoology, University of California | 83 |
| Field Museum of Natural History, Chicago | 70 |
| Museum of Comparative Zoology, Cambridge | 35 |
| Academy of Natural Sciences, Philadelphia | 31 |
| University of Nebraska, Lincoln | 15 |
| Kansas University Museum of Natural History, Lawrence | 5 |
| Biological Survey of South Dakota | 1 |
| Total number of specimens | 1,562 |

[2] In only four cases do forms of the two species overlap in distribution, for comparatively limited areas in each case, as follows:

*O. l. brevicaudus* and *O. t. longicaudus* in western Nevada and Mono County, California.

*O. l. ruidosæ* and *O. t. torridus* in southwestern Arizona, northern Sonora, southern New Mexico, northern Chihuahua, and extreme western Texas.

*O. l. arcticeps* and *O. t. torridus* in the Pecos Valley, New Mexico and Texas.

*O. l. albescens* and *O. t. torridus* in northern Chihuahua.

which to diagnose the two species of *Onychomys*, for though the peculiarities they exhibit are less easily discerned than are the superficial differences that have heretofore answered, they are, of course, of far greater importance and phylogenetic meaning.

The subspecies of each group are closely related and intergradation is in almost every case shown by the material examined. The races are, in the main, well marked over a considerable territory and usually exhibit some conspicuous deviation in color accompanied by variations in dimensions or relative cranial characteristics.

The marked diversity in color of skins of *Onychomys* from almost any locality has given rise to a general impression that true dichromatism is, in a measure, responsible for the wide differences exhibited. That such is not the case has been one of the general results of the present study. Cases of supposed dichromatism represent various stages in a definite sequence of pelages, shown by a comparison of animals of various ages as determined by the relative wear of the teeth. In *torridus* and its subspecies this sequence of pelages is especially complex and, in both groups, abrasion and fading, combined with a gradual moult and renewal, has made the study of the pelages an interesting problem. In an account of the various subspecies it is necessary in nearly every case to describe fully the color of several stages of pelage, so widely do individuals of the same form differ with age and season.

## MEASUREMENTS.

In the tables of measurements appended only the dimensions of fully adult animals have been considered. Measurements of selected specimens showing considerable tooth wear and from as many localities as possible have been used. The total length, tail, and foot measurements are from collector's notes, made from fresh specimens. The length of ear has been taken from the dry skin. The cranial and dental measurements were made with sliding calipers registering tenths of a millimeter. Condylobasal length was taken from condylion to alveolar point, *not* to most anterior point of the premaxillæ.

## ACKNOWLEDGMENTS.

An intelligent revision of the grasshopper mice would not have been possible without assembling the collections from various museums for study. Thanks are due the custodians of several mammal collections for the loan of material, which has, in several cases, included types and type series. To Dr. J. A. Allen, of the American Museum of Natural History, New York; to Mr. Joseph Grinnell, Museum of Vertebrate Zoology, University of California; to Mr. Charles B. Cory and Mr. W. H. Osgood, Field Museum of Natural History, Chicago; to Mr. Samuel Henshaw and Mr. Outram

Bangs, Museum of Comparative Zoology at Harvard; and to Dr. Witmer Stone, Philadelphia Academy of Sciences, I am indebted for the loan of valuable material, all of which was assembled by the Biological Survey, through the courtesy of Mr. E. W. Nelson. In the lists of specimens examined I have indicated the source of all material from localities not represented in the United States National Museum collections. Mr. Vernon Bailey, of the Biological Survey, has given me much information regarding physiographical conditions in localities from which the small number of specimens examined hardly warranted the mapping of boundaries of forms, without intimate knowledge of the country.

## SYSTEMATIC DISCUSSION.

### Genus ONYCHOMYS Baird.

1857. *Onychomys* BAIRD, Gen. Rep. North Amer. Mamm., p. xxviii and p. 457 (subgenus of *Hesperomys* Waterhouse).
1874. *Onichomys* GIGLIOLI, Boll. Soc. Geogr. Italiana, vol. 11, p. 326.

*Type-species.*—*Hypudaeus leucogaster* Wied.

*Diagnosis.*[1]—Form stout, tail comparatively short, thick, and tapering to an obtuse point, the end usually white. Fore feet larger than in *Peromyscus*, five-tuberculate. Hind feet with only four tubercles, all phalangeal; the sole densely furred from heel to tubercles. Mammæ, pectoral, 1-1; inguinal, 2-2 = 6. Nasals wedge-shaped, terminating posteriorly considerably behind the end of the nasal branch of the premaxillaries. Coronoid process of mandible well developed, rising high above the condylar ramus and directed backward in the form of a large hook. First and second upper molars large; third less than half the size of the second. First upper molar with two internal and three external cusps, the anterior cusp when unworn unequally divided at summit into two or three cusplets, narrow, and on a line with the outer cusp row, leaving a distinct step on the inside. Second upper molar with two internal and two external cusps, and a narrow antero-external fold. Last upper molar broader than long or subcircular in outline. First lower molar with an anterior, two internal and two external cusps, and a postero-internal loop. Second lower molar with two internal and two external cusps, an antero-external and a postero-internal fold. Third lower molar scarcely longer than broad, subcircular in outline.

*Color pattern.*—Sharply bicolor; head, back, and upper sides colored; underparts white, with line of demarcation sharply drawn; lanuginous tufts at bases of ears commonly whitish or buffy and contrasting with general color of head and ears; arms, hands, inner sides of legs, and feet whitish; tail usually bicolor, with tip whitish.

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[1] With slight modification, taken from Merriam, North Amer. Fauna, No. 2, pp. 3-4. October, 1889.

*Geographic distribution.*—Western North America, from the Great Plains of Alberta, Saskatchewan, and Manitoba south to central Mexico (Aguas Calientes and San Luis Potosi); east to western Minnesota and eastern Kansas. Absent from large areas in the higher Rockies and the Pacific Coast region. (See fig. 1.)

*Remarks.*—*Onychomys* differs from *Peromyscus*, its nearest generic relative, in its more hypsodont molars, and in the position and shape of the front cusp of $m^1$, which is distinctly in the outer row of cusps, more coniform, less broadened transversly, and with the unworn summit less inclined to division into cusplets; $m^3$ is more reduced; and the coronoid process is greatly lengthened. Although it externally resembles *Cricetulus* much more than it does *Peromyscus*, it is as shown by a study of the teeth, separated from the old-world genus by both *Peromyscus* and *Baiomys*. The latter, with its close approach to the six-tuberculate pattern in $m^1$, appears, of the three groups, the nearest to *Cricetulus*. Osgood[1] has pointed out certain peculiarities of resemblance between the subgenus *Podomys*, of *Peromyscus*, and *Onychomys;* and has suggested the possibility that *Podomys* is an intermediate form between *Onychomys* and typical *Peromyscus*. The reduction in the number of plantar tubercles in *Podomys* is probably of no importance in this connection, but the higher-crowned teeth and the relative position of the anterior cusp of the first molar

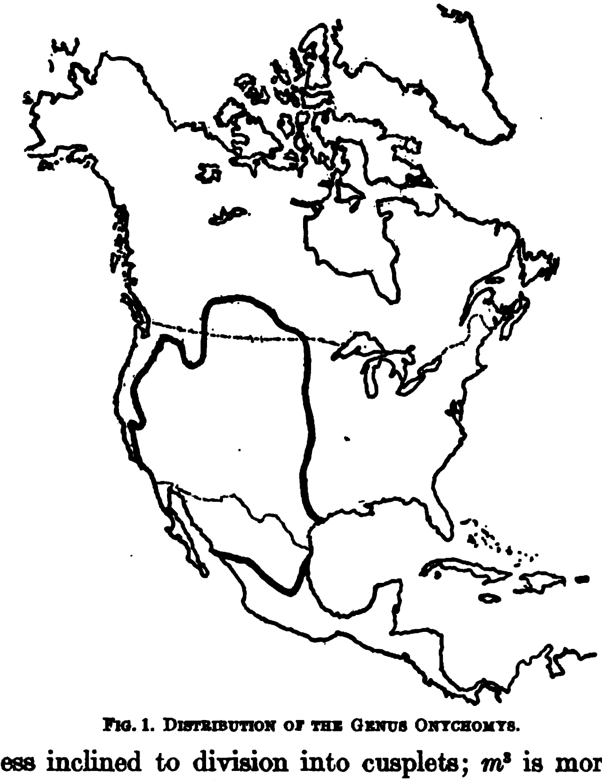

FIG. 1. DISTRIBUTION OF THE GENUS ONYCHOMYS.

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[1] North Amer. Fauna, No. 28, p. 227. Apr. 17, 1909.

are characters that make the closer relationship seem very probable. Though distinctly belonging with *Peromyscus*, *Podomys* is the nearest approach within that genus to *Onychomys*.

### LIST OF SPECIES AND SUBSPECIES WITH TYPE-LOCALITIES.

*Onychomys leucogaster.*

| | |
|---|---|
| *O. l. leucogaster* (Wied) | Fort Clark, North Dakota, p. 434. |
| *O. l. missouriensis* (Audubon and Bachman) | Fort Union, Montana, p. 438. |
| *O. l. arcticeps* Rhoads | Clapham, New Mexico, p. 439. |
| *O. l. brevicaudus* Merriam | Blackfoot, Idaho, p. 441. |
| *O. l. fuscogriseus* Anthony | Ironside, Oregon, p. 443. |
| *O. l. melanophrys* Merriam | Kanab, Utah, p. 444. |
| *O. l. fuliginosus* Merriam | Black Tank, Arizona, p. 447. |
| *O. l. ruidosæ* Stone and Rehn | Ruidoso, New Mexico, p. 448. |
| *O. l. capitulatus* Hollister | Grand Canyon, Arizona, p. 450. |
| *O. l. albescens* Merriam | Samalayuca, Chihuahua, p. 450. |
| *O. l. longipes* Merriam | Concho County, Texas, p. 451. |
| *O. l. breviauritus* Hollister | Fort Reno, Oklahoma, p. 453. |

*Onychomys torridus.*

| | |
|---|---|
| *O. t. torridus* (Coues) | Camp Grant, Arizona, p. 456. |
| *O. t. perpallidus* Mearns | Yuma County, Arizona, p. 459. |
| *O. t. pulcher* Elliot | Morongo Pass, California, p. 461. |
| *O. t. longicaudus* Merriam | St. George, Utah, p. 463. |
| *O. t. clarus* Hollister | Keeler, California, p. 465. |
| *O. t. tularensis* Merriam | Bakersfield, California, p. 466. |
| *O. t. ramona* Rhoads | San Bernardino Valley, California, p. 468. |
| *O. t. macrotis* Elliot | San Pedro Martir Mountains, Lower California, p. 469. |
| *O. t. yakiensis* Merriam | Camoa, Sonora, p. 470. |
| *O. t. canus* Merriam | San Juan Capistrano, Zacatecas, p. 471. |
| *O. t. surrufus* nobis | Miquihuana, Tamaulipas, p. 472. |

### BRIEF SYNOPSIS OF THE CHARACTERS OF SPECIES AND SUBSPECIES.

Size averaging larger; tail relatively short, usually less than half the length of head and body; skull averaging larger, with comparatively narrow interorbital region; teeth higher crowned, unworn cusps of $m^1$ higher than long; $m^3$ larger, subcircular; $m^1$ usually less than half the length of tooth row.......... **O. leucogaster.**

Color of adults in fresh pelage light; distinctly buffy or cinnamon; not fuscous, sooty, or brownish.

Hairs of underparts entirely white, without dark underfur..*O. l. albescens*, p. 450.

Hairs of underparts white, with gray underfur.

Size small (hind foot 17–20 mm.; skull, condylobasal length, 23.8–26.0); color grayish-buff................................ *O. l. brevicaudus*, p. 441.

Size large (hind foot 18.5–23; skull, condylobasal length, 24.8–27.7); color pinkish-cinnamon-buff.

Color duller and paler; face lighter.................*O. l. arcticeps*, p. 439.

Color richer and darker; face darker............*O. l. melanophrys*, p. 444.

Color of adults in fresh pelage dark; fuscous, sooty, or brownish; not distinctly buffy or cinnamon.

Ear tufts white or whitish, conspicuously different from color of crown.

Size smaller, with smaller skull (condylobasal length, 24.4–25.2; breadth braincase, 12.4–12.9); ears larger (14.5–15.8)...........*O. l. fuscogriseus*, p. 443.

Size larger, with larger skull (condylobasal length, 25.4–28.0; breadth braincase, 12.9–13.6); ears smaller (12.6–15.8).

Color paler; the young much grayer, less blackish; hind foot less than 22 mm.................................*O. l. missouriensis*, p. 438.

Color darker; the young more blackish, less gray; hind foot 22 mm..........................................*O. l. leucogaster*, p. 434.

Ear tufts cinnamon-brown or smoky, not conspicuously different from color of crown.

Skull elongated, with high braincase.

Ear large (15.0–16.9 mm. from notch)................*O. l. longipes*, p. 451.

Ear small (11.9–13.9 mm. from notch)............*O. l. breviauritus*, p. 453.

Skull not elongated; braincase flattened.

Color very dark; more sooty, less brown...........*O. l. fuliginosus*, p. 447.

Color less dark; more brownish, not sooty.

Size larger (skull, condylobasal length, average, 26.2; zygomatic breadth, 14.8)..........................................*O. l. ruidosæ*, p. 448.

Size smaller (skull, condylobasal length, average, 25.1; zygomatic breadth, 14.0)......................................*O. l. capitulatus*, p. 450.

Size averaging smaller; tail relatively long, usually more than half the length of head and body; skull averaging smaller, with comparatively wide interorbital region; teeth lower crowned, unworn cusps of $m^1$ longer than high; $m^3$ smaller, broadened transversely; $m^1$ usually more than half the length of tooth row.....**O. torridus.**

Color of adults in fresh pelage pale pinkish-cinnamon; not drab, brown, nor decidedly dark pinkish-cinnamon.

Anterior palatine foramina short, not extending backward to plane of fronts of first molars....................................*O. t. longicaudus*, p. 463.

Anterior palatine foramina longer, extending backward fully to plane of fronts of first molars.

Size larger (total length, 146–161; tail, 57–58; hind foot, 20–22)..........................................................*O. t. perpallidus*, p. 459.

Size smaller (total length, 120–146; tail, 37–53; hind foot, 18–20.5).

Color very pale pinkish-cinnamon...................*O. t. pulcher*, p. 461.

Color rich, intense pinkish-cinnamon.................*O. t. clarus*, p. 465.

Color of adults in fresh pelage brown, drab, or decidedly dark pinkish-cinnamon; not pale pinkish-cinnamon.

Color of adults grayish-drab; not brown or cinnamon.

Ear small (14.0–15.1)..............................*O. t. tularensis*, p. 466.

Ear large (15.2–17.1)..................................*O. t. canus*, p. 471.

Color of adults brown or dark pinkish-cinnamon; not grayish-drab.

Head and face, in fresh, full pelage, dark brown, much darker than back; general coloration darker.

Size smaller (total length, 137–148; hind foot, 19–21); ear small (14.2–15.4)..............................................*O. t. ramona*, p. 468.

Size larger (total length, 148-155; hind foot, 21–22); ear large (16.7–16.8)..............................................*O. t. macrotis*, p. 469.

Head and face, in fresh, full pelage, light brown, not conspicuously darker than back; general coloration lighter.

Ear tufts in full pelage white, conspicuous; ear small (12.0–15.8)..........................................................*O. t. torridus*, p. 456.

Ear tufts in full pelage buffy-cinnamon, not conspicuous; ear large (15.2–17.8).

Size larger, with longer tail (55–64); audital bullæ large..........................................................*O. t. surrufus*, p. 472.

Size smaller, with shorter tail (47–57); audital bullæ small..........................................................*O. t. yakiensis*, p. 470.

### ONYCHOMYS LEUCOGASTER (Wied).

(Synonymy under subspecies.)

*Diagnosis.*—Size averaging considerably larger than in *Onychomys torridus*, stouter and heavier built; tail relatively short, usually less than half the length of head and body. Skull averaging larger than in *torridus*, with comparatively narrow interorbital region. Teeth, as compared with teeth of *torridus*, higher crowned; unworn cusps of $m^1$ higher than long; the anterior cusp more coniform, with less indication of incipient division at summit into two ot three cusplets; $m^1$ less narrow and elongated, stouter and relatively short; $m^3$ larger than in *torridus*, longer than wide, or subcircular with longitudinal and transverse diameters nearer equal; the crown surface usually about one-third that of $m^2$ (sometimes nearly one-half, rarely about one-fourth); owing to the shortening of $m^1$ and the enlargement of $m^3$, $m^1$ is almost invariably less than half the length of tooth row.

*Geographic distribution.*—Western United States and Canada and northern Mexico. From the Great Plains of Alberta, Saskatchewan, and Manitoba south into Sonora, Chihuahua, and Tamaulipas, Mexico. East to western Minnesota and eastern Kansas; west to central Washington and Oregon, extreme northern and eastern California, and, in Arizona, to the Grand Canyon. Absent from large areas in the higher Rockies, the Pacific coast region, the Colorado and Mohave Deserts, and the extreme southwestern United States in general (fig. 2).

*Subspecies.*—Twelve well marked geographical races of *Onychomys leucogaster* are recognized. Most of these forms occupy large areas which correspond well with the mapped zones and faunal regions of the Western States. Two local variations from lava-bed and sand-dune districts are imperfectly known. The most differentiated forms are from the northwestern and extreme southeastern parts of the range.

### ONYCHOMYS LEUCOGASTER LEUCOGASTER (Wied).

1841. *Hypudaeus leucogaster* WIED, Reise in das innere Nord-America, vol 2, p. 99.

1857. *Hesperomys leucogaster* BAIRD, Gen. Rep. North Amer. Mamm., p. xxviii.

1857. *Onychomys leucogaster* BAIRD, Gen. Rep. North Amer. Mamm., p. 459.

1857. *Hesperomys* (*Onychomys*) *leucogaster* BAIRD, Gen. Rep. North Amer. Mamm., p. 480.

1885. *O*[*nychomys*] *leucogaster* var. *pallidus* HERRICK, Geol. and Nat. Hist. Surv. Minnesota, 13th Ann. Rep. (1884), p. 183. (Lake Traverse, near sources of the Minnesota and Bois des Sioux Rivers, South Dakota.)

1885. *O*[*nychomys*] *pallidus* HERRICK, Geol. and Nat. Hist. Surv. Minnesota, 13th Ann. Rep. (1884), p. 184.

1888. *Cricetus leucogaster* THOMAS, Proc. Zool. Soc. London, 1888, p. 133.

1888. *C*[*alomys*] *leucogaster* JORDAN, Man. Vert. Anim. North. U. S., ed. 5, p. 321.

1912. *Onychomys leucogaster leucogaster* MILLER, Bull. 79, U. S. Nat. Mus., p. 127. December 31.

*Type-locality.*—Mandan Indian village, near Fort Clark, Missouri River, North Dakota; near site of present town of Stanton, Mercer County, North Dakota.

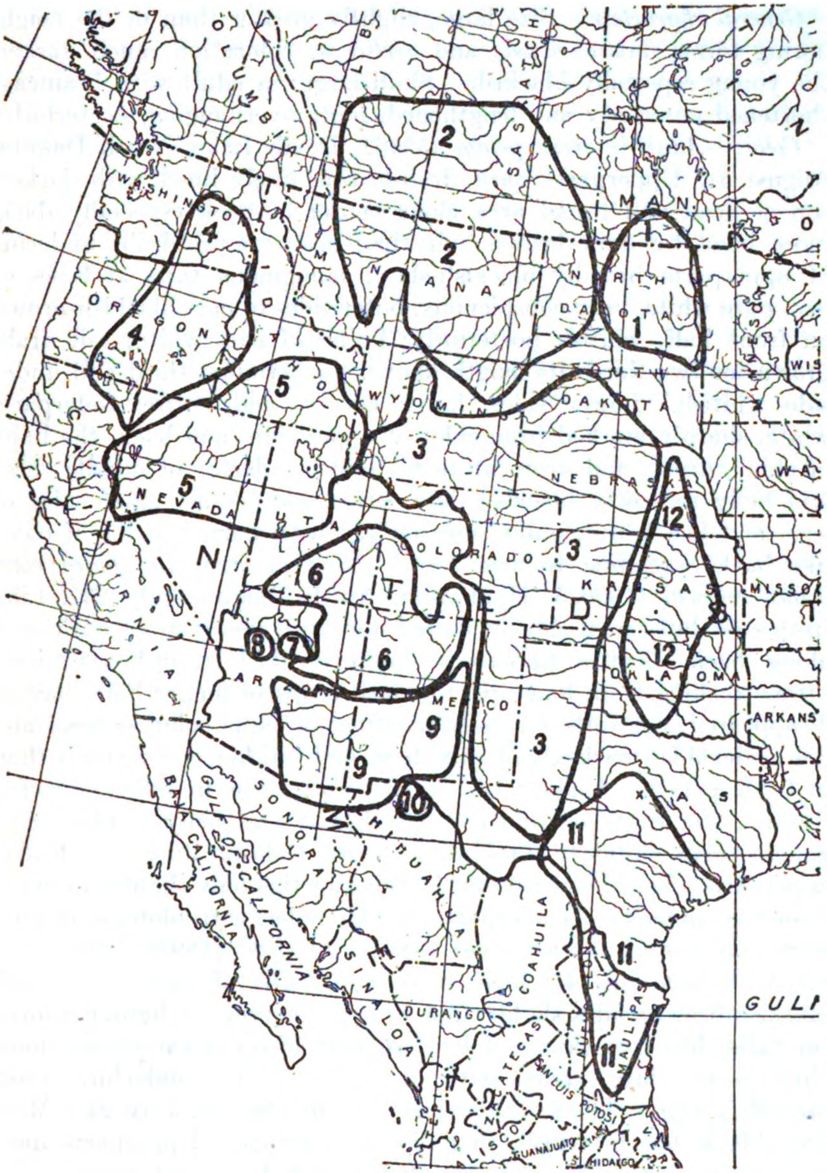

FIG. 2.—DISTRIBUTION OF THE SUBSPECIES OF ONYCHOMYS LEUCOGASTER.

1. O. l. leucogaster.
2. O. l. missouriensis.
3. O. l. arcticeps.
4. O. l. fuscogriseus.
5. O. l. brevicaudus.
6. O. l. melanophrys.
7. O. l. fuliginosus.
8. O. l. capitulatus.
9. O. l. ruidosæ.
10. O. l. albescens.
11. O. l. longipes.
12. O. l. breviauritus.

*Geographic distribution.*—Southern Manitoba, eastern North Dakota, northeastern South Dakota, and parts of extreme western Minnesota, west to Minot and Fort Clark, North Dakota. Transition zone.

*General characters.*—Size large, slightly greater than in the neighboring forms, *missouriensis* and *arcticeps;* coloration much darker, the young especially blackish. Skull large; in adult with braincase shortened anteriorly and lengthened, more overhanging, posteriorly.

*Color.*—*Adult in fresh pelage* (55462, Devils Lake, North Dakota, August 5): Upperparts dark drab-brown, finely lined with darker; top of head and broad area along center of back especially dark, more lined by dark brown hair tips; nose grayish-drab; underfur of upperparts broadly blackish-slate; lanuginous tufts at bases of ears pure white, very conspicuous; outer sides of ears blackish-brown on front half, whitish posteriorly; lining of ears white; tail drab-brown for two-thirds its length above, the terminal third and under side whitish. Lower sides, lower cheeks, and entire underparts white, sharply marked from color of upper sides and back, the hairs of chin, throat, and arms white to bases; underfur of middle chest and belly narrowly blackish-slate; arms and hands, inner sides of legs, and feet white; outer sides of legs with narrow stripe of color like back extending to near foot. *Adult in worn and faded coat, before renewal* (180025, Hankinson, North Dakota, July 23): Like fresh coat but much shorter haired and with less distinct dark area along back. Entire upperparts uniform dark drab-brown, with little streaking from hair tips, the darker tips of longer hairs having disappeared; ear tufts virtually wanting, of same color as head and not noticeable; markings of ears, legs, and tail less conspicuous than in fresh pelage. Underparts grayish-white, the underfur showing through the white of thinly haired breast and belly. *Adult, melanistic phase* (180024, Hankinson, North Dakota, July 23): Entire upperparts glossy brownish-black, the hair tips only slightly browner than the underfur. Underparts slightly paler, with blotches of pure white on throat, breast, and arms. *Juvenile* (189252, Traverse, South Dakotá, July 4): Nose, head, and center of back to tail dark blackish-brown; sides slightly paler, more grayish; no lighter colored ear tufts; black markings of forward part of outer ear conspicuous. Underparts white, mixed with grayish from the underfur. *Post-juvenile pelage* (202088, Fort Clark, North Dakota, July 24): More slaty-black, less brownish, than the first pelage. Upperparts dark grayish-drab, sides lighter; ear tufts whitish, conspicuous; under parts very sharply marked from color of sides, whitish with slate-gray underfur on chest and belly. Much darker than the young of *missouriensis* or *arcticeps.*

*Skull.*—The skull of *Onychomys leucogaster leucogaster* is larger than that of any other form of *Onychomys.* It slightly exceeds in general measurements any of the skulls of other subspecies in the *leucogaster* group. The frontal region is highly arched, the braincase is short and broad, the interorbital region greatly constricted, and the occiput elongated. (Plate 15.)

*Measurements.*—Averages and extremes of three adult specimens from North Dakota: Total length, 164 (160–168) millimeters; tail vertebræ, 42 (38–47); hind foot, 22 (22–22); ear from notch in dry skin, 14.0 (13.3–14.4). Skull: Condylobasal length, 27.4 (26.2–28.0); zygomatic breadth, 16.2 (15.1–17.3); interorbital breadth, 4.6 (4.5–4.7); breadth of braincase, 13.3 (13.2–13.4); length of nasals, 11.4 (10.5–12.3); length of mandible, 16.7 (15.9–17.3); maxillary tooth row, 4.5 (4.4–4.6). For detailed measurements of specimens, see page. 474.

*Type-specimens.*—Nothing is known of the later history of the specimens on which Wied based his account of *Hypudaeus leucogaster.*

*Remarks.*—This subspecies reaches its extreme type of dark coloration in southeastern North Dakota, northeastern South Dakota, and at Brown Valley, Minnesota. At some points in this region a few specimens are partially melanistic. There are obviously only two recognizable forms on the northern plains, the large pale subspecies to the westward, *missouriensis*, and the large dark subspecies near the eastern limits of the range. A good series of specimens from the type localities of *missouriensis*, *leucogaster*, and *pallidus*, prove the distinctness of the first two and the identity of *pallidus* with true *leucogaster.* Specimens from Fort Clark, the type-locality of *leucogaster*, are easily nearest the dark form, are widely different in color from *missouriensis*, and plainly represent the eastern race. The younger specimens from Fort Clark are especially dark, like young from the Traverse Lake region, and are quite different from the young of *missouriensis.*

The whereabouts of the type-specimen of Herrick's *O. l. pallidus* can not be ascertained. Prof. Charles E. Johnson, of the University of Minnesota, writing under date of September 19, 1913, says:

> No one in the department seems to know what became of Herrick's material, whether he took it with him when he left Minnesota or whether it has been lost or destroyed in subsequent movings and shiftings in the department.

Fortunately the collection of the Biological Survey contains four topotype specimens of "*pallidus*," as well as other material from near-by localities.

*Specimens examined.*—Total number 55, from the following localities:

North Dakota: Bottineau, 5 (Field Mus.); Devils Lake, 3; Fort Clark, 18 (topotypes); Grace, 1; Hankinson, 8; Linton, 2; Minnewaukon, 1 (Field Mus.); Minot, 2 (Field Mus.); Pembina, 1; Sherbrooke, 1.

South Dakota: Sisseton, 7; Traverse, 4 (topotypes of "*pallidus.*")

Minnesota: Brown Valley, 2.

### ONYCHOMYS LEUCOGASTER MISSOURIENSIS (Audubon and Bachman).

1851. *Mus missouriensis* AUDUBON and BACHMAN, North Amer. Quad., vol. 2, p. 327, pl. c.

1862. *Mus missuriensis* WIED, Verz. der auf seiner Reise Nord-Am. beob. Säug., p. 161, in synonymy.

*Type-locality.*—Fort Union, Montana.

*Geographic distribution.*—Southeastern Alberta, southern Saskatchewan, northern and eastern Montana, western North Dakota, and northeastern Wyoming. North to Calgary, Alberta, and Carlton, Saskatchewan; east to Glenullin, North Dakota; south up the Missouri River to Bozeman, Montana, and up the branches of the Powder and Little Missouri Rivers into northeastern Wyoming. Chiefly arid Transition.

*General characters.*—Size large, only slightly less than in true *leucogaster*, with smaller hind foot. Coloration in all pelages much lighter than in *leucogaster*, the immature especially paler than young of the more eastern form. Darker, less buffy, than *arcticeps.*

*Color.*—*Adult in full winter pelage* (189237, Dickinson, North Dakota, February 14): Upperparts dark wood-brown, the head and middle parts of body heavily darkened by the color of the darker brown hair tips; underfur dark neutral-gray; lanuginous ear tufts pure white and very conspicuous, as are also the black and white markings on outer side of the ear. Lips, lower cheeks, arms, hands, lower legs, feet, lower sides, and entire underparts pure white, very sharply marked from color of upperparts. *Adult in early summer* (168548, Buford, North Dakota, May 8): Like winter pelage but less bright in color, the rich wood-browns faded and worn to drab and buff; the head and back dark grayish-brown; and the white of underparts mixed with gray of the underfur. *Juvenile* (69045, Medicine Hat, Alberta, October 13): Very much lighter and grayer, less blackish, than the young of *leucogaster.* Upperparts mouse-gray, streaked with darker hair tips; white ear tufts and black and white markings on the ears conspicuous. *Post-juvenile pelage* (168546, Buford, North Dakota, May 5): Like the juvenile but browner, less ashy mouse-gray; the back and sides uniformly colored, without distinctly darker dorsum.

*Skull.*—The skull is slightly smaller and less highly arched than that of true *leucogaster;* the interorbital constriction is less, and the braincase comparatively larger.

*Measurements.*—Averages and extremes of eleven adults from Alberta, Montana, North Dakota, and Wyoming: Total length, 150 (141–161); tail vertebræ, 39 (29–45); hind foot, 20.8 (20.0–21.5); ear from notch in dry skin, 14.2 (12.6–15.8). Skull: Condylobasal length, 26.1 (25.4–26.6); zygomatic breadth, 15.3 (14.9–16.0); interorbital breadth, 4.7 (4.5–4.9); breadth of braincase, 13.2 (12.9–13.6); length of nasals, 10.9 (10.4–11.0); length of mandible, 15.6 (14.9–15.9);

maxillary tooth row, 4.4(3.9–4.6). For detailed measurements of specimens see page 474.

*Type-specimen.*—Regarding the specimens on which their description and figure were based, Audubon and Bachman say:

> This pretty little animal was discovered for us by Mr. Denig, during our sojourn at, and in the neighborhood of Fort Union in 1843. It was in full summer pelage, having been killed on the 14th of July. * * * The next day after they were brought in, we left the fort on an expedition to the Yellow-Stone River * * *[1].

It is not known if, after the drawings were made, the specimens were preserved or not.

*Remarks.*—This subspecies is chiefly distinguished from true *leucogaster* by its lighter color in all pelages. It attains its extreme pallor in Saskatchewan, but is, on the whole, very uniform in color over all the mapped range. Specimens from Dickinson, North Dakota, show the nearest approach to *leucogaster*, but are distinctly nearest to *missouriensis*. In the southeastern parts of its range, *missouriensis* blends directly into *O. l. articeps.*

*Specimens examined.*—Total number 62, from localities as follows:

ALBERTA: Calgary, 2; Medicine Hat, 1.

SASKATCHEWAN: Carlton, 1; Osler, 3 (Mus. Comp. Zool.).

MONTANA: Bozeman, 2; Fort Custer, 8; Fort Union, 1; Great Falls, 1; Johnson's Lake, 2; Mountain Sheep Buttes, 1; Pass Creek, 1; Powderville, 1; Robare, 1; Tilyou's Ranch, 3.

NORTH DAKOTA: Buford, 8; Dickinson, 3; Fort Buford, 11; Glenullin, 1.

WYOMING: Arvada, 4; Little Powder River, 2; Moorcroft, 5.

### ONYCHOMYS LEUCOGASTER ARCTICEPS Rhoads.

1896. *Onychomys leucogaster brevicauda* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 8, p. 253. November 25. (Specimens from Wyoming and Colorado.)

1898. *Onychomys arcticeps* RHOADS, Proc. Acad. Nat. Sci. Philadelphia, 1898, p. 194. May 3.

1907. *Onychomys brevicaudus* CARY, Proc. Biol. Soc. Washington, vol. 20, p. 25. March 27.

*Type-locality.*—Clapham, Union County, New Mexico.

*Geographic distribution.*—Upper Sonoran Great Plains, from Wyoming and South Dakota to Texas. North to the Big Horn River in Wyoming and to the Cheyenne River in South Dakota; east to Bonesteele, South Dakota, and Trego County, Kansas; south to Fort Lancaster, Texas; and west to Bear River Divide in southwestern Wyoming, Golden and Salida, Colorado, and Santa Rosa, New Mexico.

*General characters.*—Like *O. l. missouriensis*, but paler, more buffy in color; much lighter than *leucogaster*, *ruidosæ*, or *breviauritus.* Resembles *O. l. melanophrys* but is less bright in coloration and is slightly smaller, with smaller hind foot and ear.

*Color.*—*Adult in full pelage* (18644, Valentine, Nebraska, April 14): Upperparts avellaneous, with a wash of brighter pinkish-cinnamon over much of back, rump, and hips; paler on face, shoulders, and back of ears; ear tufts white but rather inconspicuous against the general light coloration of head; markings of outer side of ears much subdued, brown on forward half, whitish, scantily haired posteriorly. Arms and hands, lower legs and feet, and entire underparts, pure white, the underfur of lower breast, sides, and belly faintly darkened with pale gray. Tail white with narrow stripe of brownish above for two-thirds its length. *Adult in short summer coat* (54452, Colby, Kansas, June 28; breeding female): Entire upperparts light drab, finely lined by the darker brownish hair tips; underparts grayish-white, the gray underfur showing through the white of hair tips on the scantily furred breast and belly. No lanuginous ear tufts. *Adult in fall coat* (150985, Gaume's Ranch, Baca County, Colorado, November 28): Upperparts avellaneous, everywhere finely streaked and darkened by the blackish hair tips; top of head and middle of back and rump slightly darker than face and sides; ear tufts buffy; underparts white. *Juvenile* (54455, Colby, Kansas, June 28): Above uniform light mouse-gray, the hairs pale gray at bases, darker gray in middle, and lightly tipped with pale brownish-gray. Underparts grayish-white; no ear tufts. *Young adult, or postjuvenile, in early winter* (8529, Philadelphia Acad. Sciences, type; Clapham, New Mexico, November 7): Like adult in summer but darker and richer colored, more brownish; the long full hairs of head and back with broad subterminal bands of dark buff and tips of blackish; lower sides brownish; underparts whitish; the underfur dark neutral-gray.

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[1] Viviparous Quadrupeds of North America, vol. 2, p. 328, 1851.

*Skull.*—Almost precisely as in *missouriensis*.

*Measurements.*—Averages and extremes of 35 adults from South Dakota, Nebraska, Kansas, Colorado, New Mexico, and Texas. Total length, 151 (131–170); tail vertebræ, 42 (34–53); hind foot, 20.9 (18.5–23.0); ear from notch in dry skin, 13.4 (12.4–14.9). Skull: Condylobasal length, 26.4 (24.5–27.7); zygomatic breadth, 15.4 (14.4–16.6); interorbital breadth, 4.6 (4.2–5.0); breadth of braincase, 13.0 (12.4–13.7); length of nasals, 11.2 (10.1–12.2); length of mandible, 15.6 (14.6–16.8); maxillary tooth row, 4.6 (4.3–4.8). For detailed measurements of specimens see page 474.

*Type-specimen.*—No. 8529, Academy of Natural Sciences, Philadelphia. Skin and skull of young male (teeth unworn and basal suture open) in fresh fall pelage of the immature. Collected November 7, 1893, by Ernest E. Thompson. Rhoads Collection, No. 1529.

*Remarks.*—Specimens of *O. l. arcticeps* from South Dakota and northern Nebraska are absolutely indistinguishable from specimens collected on the Staked Plains in New Mexico and Texas. Intergradation with neighboring forms takes place wherever the ranges meet and it is sometimes difficult to identify immature or poorly furred specimens with any particular form. Skins from Santa Rosa, New

Mexico, show a decided approach toward *ruidosæ*, and specimens from Paladora Canyon, Texas, are strongly tending toward *breviauritus*. In general, however, the race is well defined and occupies the greater part of the arid Upper Sonoran region of the Great Plains.

*Specimens examined.*—Total number, 331, from localities as follows:

South Dakota: Bonesteel, 1; Buffalo Gap, 1; Corral Draw, 1 (Amer. Mus.); Minniechaduza River, 1; Pine Ridge, 2; Smithville, 1; South fork White River, 1; Stanley County, 1 (State Biol. Surv. S. Dak.).

Wyoming: Aurora, 1 (Amer. Mus.); Big Sandy, 7; Bitter Creek, 20 (Amer. Mus. and Field Mus.); Bordeaux, 1; Bridger Creek, 1; Bridger's Pass, 2; Bull Lake, 1; Casper, 5; Cheyenne, 1; Chugwater, 1; Cumberland, 1; Fontenelle, 4; Fort Bridger, 1; Green River, 1; Grey Bull, 1; Kemmerer, 3; Kinney Ranch, 2; Medicine Bow Mountains, 1; Mountain View, 4; Newcastle, 1; Owl Creek Mountains, 1; Saratoga, 4; Sun, 5; Superior, 1.

Nebraska: Birdwood Creek, 2; Callaway, 4; Cherry County, 1; Cody, 2; Fort Niobrara, 1; Haigler, 5; Kennedy, 7; Lakeside, 4; Lincoln County, 3; Mitchell, 6 (Univ. of Nebr.); Myrtle, 2; Niobrara River, 12; Perch, 19 (Amer. Mus. and Field Mus.); Snake River, 1; Thomas County, 4; Valentine, 9; Warbonnet Canyon, Sioux County, 4 (Univ. of Nebr.).

Colorado: Burlington, 2; Canadian Creek, 5; Cañon City, 1; Cheyenne Wells, 1 (Amer. Mus.); Colorado Springs, 16 (Field Mus., Amer. Mus., Univ. of Calif., and Mus. Comp. Zool.); Denver, 1 (Amer. Mus.); Gaume's Ranch, Baca County, 1; Golden, 1; Greeley, 2; Higbee, 1; Hugo, 2; La Junta, 1; Las Animas, 1; Lay, 1; Limon, 2; Loco, 2; Longmont, 1; Loveland, 14; Monon, 1 (Mus. Comp. Zool.); Pawnee Buttes, 2; Roggen, 1; Salida, 1; Snake River, 2; Sterling, 3; Three Forks, 1 (Amer. Mus.); Wray, 3 (Amer. Mus.).

Kansas: Colby, 5; Ellis, 1; Logan County, 6 (Amer. Mus. and Kans. Univ.); Meade, 1; Pendennis, 9; Trego County, 15.

Texas: Amarillo, 1; Fort Lancaster, 1; Hereford, 2; Lipscomb, 12; Miami, 1; Mobeetie, 1; Monohans, 2; Paladora Canyon, 2 (Field Mus.); Texline, 12; Washburn, 2.

New Mexico: Carlsbad, 4; Clapham, 4 (Phila. Acad. Sci., including type; Mus. Comp. Zool.); Clayton, 1; Fort Sumner, 2; Koehler Junction, 1; Roswell, 6; Santa Rosa, 6.

### **ONYCHOMYS LEUCOGASTER BREVICAUDUS Merriam.**

1891. *Onychomys leucogaster brevicaudus* Merriam, North Amer. Fauna, No. 5, p. 52. July 30.

*Type-locality.*—Blackfoot, Bingham County, Idaho.

*Geographic distribution.*—Southern Idaho, extreme southwestern Wyoming, northwestern Utah, and west across the northern half of Nevada into Lassen, Plumas, and Mono Counties, California.

*General characters.*—Smallest of the subspecies of *leucogaster*, with small hind foot and short tail. Coloration darker than in *arcticeps*, lighter than in *fuscogriseus*.

*Color.*—*Adult in fresh winter pelage* (24897, Reese River, Nevada, November 24): Upperparts rich glossy avellaneous, the face, head, back, and rump darkened by streaking of the brownish hair tips; sides, hips, and lower rump more cinnamon color; ear tufts pure white at bases, buffy above; ears sharply marked dark brown and white; tail grayish-brown above, with white tip. Entire underparts, including whole of arms, hands, lower cheeks, inner sides of legs, and the feet pure white. *Adult in summer* (23086, type, Blackfoot, Idaho, July 15): Like winter specimens but faded, less glossy; the hair tips worn away and the gray of underfur showing through the worn pelage, greatly modifying the general color. Ear tufts not noticeable and color of ears greatly subdued. *Juvenile* (94668, Golconda, Nevada, July 3): Almost precisely like the young of *O. l. arcticeps*, but black markings on ears more conspicuous. *Immature* (22996, Blackfoot, Idaho, July 12): Like the juvenile but less ashy, more mouse gray; the ear markings less conspicuous, the ear tufts whiter.

*Skull and teeth.*—Compared with skulls of *missouriensis* and *arcticeps*, the skull of *brevicaudus* is short, flat, and comparatively broad, with short and stout rostrum and much flattened brain case. In size it averages less than skulls of any other subspecies of *leucogaster*. The teeth are also slightly smaller than in the other races.

*Measurements.*—Averages and extremes of 17 adults from Idaho, Utah, and Nevada: Total length, 141 (130–155); tail vertebræ, 39 (31–42); hind foot, 19.1 (17–20); ear from notch in dry skin, 15.6 (14.4–16.7). Skull: Condylobasal length, 24.8 (23.8–26.0); zygomatic breadth, 14.3 (13.4–14.8); interorbital breadth, 4.9 (4.7–5.1); breadth of braincase, 12.8 (12.3–13.3); length of nasals, 10.0 (9.4–10.5); length of mandible, 14.4 (13.7–15.0); maxillary tooth row, 4.0 (3.8–4.2). For detailed measurements of specimens see page 475.

*Type-specimen.*—No. $\frac{23086}{30682}$, United States National Museum, Biological Survey Collection. Skin and skull of adult male (teeth much worn). Collected July 15, 1890, by Vernon Bailey and B. H. Dutcher. Original number 1442.

*Remarks.*—This is a small, well marked subspecies, with a rather extensive distribution in the Great Basin. It intergrades with *arcticeps* in southwestern Wyoming, and with *fuscogriseus* all along the northwestern border of its range. It is quite impossible to determine many single specimens from the border line between the distribution of *fuscogriseus* and *brevicaudus*, but in the main the limits of the two subspecies have been well worked out. Juvenile examples are especially helpful, as the color differences between the two races are particularly developed in the young.

*Specimens examined.*—Total number, 117, from localities as follows:

IDAHO: Big Lost River, 1; Blackfoot, 6, type and paratypes; Glenn's Ferry, 5; Minidoka, 5; Montpelier Creek, 1; Murphy, 1.

WYOMING: Bear River, 3; Cokeville, 1; Evanston, 6.

UTAH: Kelton, 1; Nephi, 7.

NEVADA: Austin, 7; Battle Mountain, 1; Bull Run Mountains, 1; Carlin, 1; Carson Sink, 1; Cottonwood Range, 1; Elko, 9; Flowing Springs, 1; Gardnerville, 1 (Mus. Comp. Zool.); Golconda, 3; Halleck, 12; Holbrook, 2 (Mus. Comp. Zool.); Monitor Valley, 1; Mountain City, 4; Osobb Valley, 2; Pine Forest Mountains, 1 (Univ. of California); Pyramid Lake, 3; Rabbit Hole Mountains, 2; Reese River, 3; Silver Creek, 1; Wadsworth, 2; Wells, 1; Winnemucca, 2.

CALIFORNIA: Amedee, 6; Benton, 1 (Univ. of California); Long Valley, 4; Mono Lake, 2; North Hot Springs, Mono County, 1 (Mus. Comp. Zool.); Sierra Valley, 4.

### ONYCHOMYS LEUCOGASTER FUSCOGRISEUS Anthony.

1913. *Onychomys leucogaster fuscogriseus* ANTHONY, Bull. Amer. Mus. Nat. Hist., vol. 32, p. 11. March 7.

*Type-locality.*—Ironside, Malheur County, Oregon; 4,000 feet altitude.

*Geographic distribution.*—Eastern Washington and Oregon, western Idaho, and northeastern California. South to Klamath Lake and the Madeline Plains.

*General characters.*—Closely related to *O. l. brevicaudus*, but darker in color; the young especially darker.

*Color.*—Similar in all pelages to *O. l. brevicaudus*, but averaging considerably darker. *Adult in summer* (88958, Swan Lake Valley, Oregon, June 13): Upperparts dark reddish-brown, rich and glossy; darkest medially, more brownish on sides and hips. Ear tufts conspicuously whitish; arms white; outer sides of legs to feet color of rump; tail blackish-brown above with grayish-white tip, white below. Younger adults vary from dark grayish-brown to rich light purplish-gray. *Juvenile* (11008, Univ. of Calif. Mus., Warner Mountains, California, July 28): Much darker, more blackish, than young of *brevicaudus* of same age. Above dark mouse gray, in some lights almost black; legs intensely colored to feet.

*Skull.*—The skull is essentially as in *O. l. brevicaudus*. (Plate 15.)

*Measurements.*—Averages and extremes of seven adults from Washington, Oregon, and California: Total length, 143 (138–149); tail vertebræ, 38 (34–40); hind foot, 19.2 (18.0–21.0); ear from notch in dry skin, 15.0 (14.5–15.8). Skull: Condylobasal length, 24.9 (24.4–25.2); zygomatic breadth, 14.1 (12.6–15.0); interorbital breadth, 4.8 (4.6–5.0); breadth of braincase, 12.7 (12.4–12.9); length of nasals

10.1 (9.8–10.3); length of mandible, 14.5 (14.2–14.9); maxillary tooth row, 4.1 (4.0–4.4). For detailed measurements of specimens see page 476.

*Type-specimen.*—No. 33544, American Museum of Natural History, New York. Skin and skull of young adult female (teeth little worn), still in immature pelage. Collected August 20, 1912, by H. E. Anthony. Original number, 121.

*Remarks.*—This is a subspecies closely related to *O. l. brevicaudus*, and differing only in color. It intergrades with *brevicaudus* in the western Snake River Valley and all along the adjoining ranges of the forms. The palest specimens I have referred to *fuscogriseus* come from the northern Plains of the Columbia. Some of these skins are nearly as light colored as true *brevicaudus*.

*Specimens examined.*—Total number, 78, from the following localities:

WASHINGTON. Asotin, 1; Baird, 3; Coulee City, 7; Douglas, 2; Mabton, 4; Pasco, 4; Rattlesnake Hills, 1; Touchet, 2.

OREGON: Alvord Valley, 1; Buck Creek, 1; Goose Lake Valley, 1; Harney, 2; Heppner, 2; Ironside, 10 (type and paratypes, Amer. Mus.); Klamath Basin, 2; Klamath Falls, 3; Narrows, 2; Plush, 2; Swan Lake Valley, 2; Tule Lake, 1; Umatilla, 5; Willows Junction, 1.

IDAHO: Nampa, 2; Weiser, 1.

CALIFORNIA: Dry Creek, Warner Mountains, 9 (Univ. of Calif.); Madeline Plains, 3; Picard, 1; Sugar Hill, Modoc County, 2 (Univ. of Calif.); Tule Lake, 1.

### ONYCHOMYS LEUCOGASTER MELANOPHRYS Merriam.

1889. *Onychomys leucogaster melanophrys* MERRIAM, North Amer. Fauna, No. 2, p. 2. October 30.

1890. *O[nychomys] melanophrys pallescens* MERRIAM, North Amer. Fauna, No. 3, p. 60. September 11. (Moki Pueblos, Navajo County, Arizona; type in U. S. National Museum.)

1890. *Onychomys melanophrys pallescens* MERRIAM, North Amer. Fauna, No. 3, p. 61. September 11.

1890. *O[nychomys] melanophrys* MERRIAM, North Amer. Fauna, No. 3, p. 61. September 11.

1895. *Onychomys leucogaster pallescens* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 7, p. 225. June 29.

1896. *Onychomys pallescens* MEARNS, Proc. U. S. Nat. Mus., vol. 18, No. 1081. Advance sheet, p. 4. May 25.

1901. *Onychomys melanophrys* MILLER AND REHN, Proc. Boston Soc. Nat. Hist., vol 30, p. 67. December 27.

1912. *Onychomys melanophrys melanophrys* MILLER, Bull. 79, U. S. Nat. Mus., p. 127. December 31.

*Type-locality.*—Kanab, Kane County, Utah.

*Geographic distribution.*—South central and southeastern Utah, southwestern Colorado, northeastern Arizona, and northwestern New Mexico. North in the Grand River Valley to Fruita, Colorado, and in the Rio Grande Valley to northern Costillo County, Colorado. West to Kanab, Utah, and Flagstaff, Arizona; east in New Mexico to Santa Fe and the Sandia Mountains; south to Acoma and the Zuni River.

*General characters.*—A bright colored race; in perfect pelage rich pinkish-cinnamon above. Much lighter colored than *ruidosæ*, *fuliginosus*, or *capitulatus*, its geographical neighbors. Darker and richer colored than *arcticeps*, of the Great Plains.

*Color.*—*Adult in full winter pelage* (57201, Bluff City Utah, November 8): Upperparts pinkish-cinnamon, finely lined with darker brownish; darkest on top of head, lower back, and rump; lower sides and hips almost pure pinkish-cinnamon. Nose lighter than head; ear tufts pale buffy; ears blackish, rimmed with white; eyebrows dark brown; tail pale brownish-gray at base above, tip and below white. Entire underparts pure white, hairs of lower breast, belly, and sides with underfur narrowly pale slate-gray. *Adult in late spring* (186479, Moki Pueblos, Arizona, May 18; type of "*pallescens*"): Much faded and paler than in fresh coat, the rich pinkish-cinnamon faded to cinnamon-buff and the darker hair tips of back much worn away; ear tufts less conspicuous than in winter. *Juvenile* (166709, Kanab, Utah, September 21): Almost precisely like the young of *O. l. arcticeps*, but very slightly paler, the face lighter, and the underparts pure white. Paler than young of *O. l. ruidosæ*. *Young adult* (161202, Kanab, Utah, September 20): Much grayer than old adults in fall, without pinkish-cinnamon on back and sides. Above drab, finely lined with darker; the back and rump lightly washed with a glossy cinnamon-drab. Underparts white.

Many old adults, among them some of the oldest specimens examined, with the teeth very much worn, do not acquire the bright pinkish-cinnamon pelage, even in winter, but remain in a coat much like that of the young adult and immature but darker. Since I have found no evidences of real dichromatism in the examination of many hundreds of specimens of *Onychomys*, and in every form each difference of color has proved a step in a true sequence of pelages, moults, and wear, I am inclined to believe that this single case of what otherwise might be regarded as dichromatism is in reality a senile pelage. Aged animals, in other words, appear not to renew into the highly colored fresh pelage of adults in the prime of life, but take on a pelage resembling that of the immature.

*Skull.*—Essentially as in *ruidosæ*. (Plate 15.)

*Measurements.*—Averages and extremes of 12 adults from Utah and Colorado: Total length, 154 (145–163); tail vertebræ, 44 (39–55); hind foot, 21.9 (21.0–23.0); ear from notch in dry skin, 14.7 (13.9–

15.4). Skull: Condylobasal length, 25.9 (24.8–27.3); zygomatic breadth, 15.1 (14.1–16.1); interorbital breadth, 5.0 (4.7–5.3); breadth of braincase, 12.7 (12.3–13.1); length of nasals, 10.9 (10.3–11.4); length of mandible, 15.4 (14.8–15.9); maxillary tooth row, 4.6 (4.4–4.8). For detailed measurements of specimens, see page 476.

*Type-specimen.*—No. 186477, United States National Museum. Skin and skull of adult male (teeth little worn), in full winter pelage. Collected December 22, 1888, by Vernon Bailey. Original number 458. Merriam collection number $\frac{5189}{6894}$. The colors, especially of tail, feet, and ears, have been destroyed by painting with corrosive sublimate and exposing to fumes of carbon bisulphide, which has turned them a dark plumbeous color.

*Remarks.*—This form intergrades with *ruidosæ* wherever the ranges meet. Specimens from New Mexico average slightly larger and have slightly longer ears than skins from Utah and Colorado, but the coloration is remarkably uniform over the mapped range of the subspecies.

The abundant material now in the collection makes it clear that *O. l. melanophrys* and *Onychomys melanophrys pallescens* Merriam are indistinguishable. The type of *pallescens*, from Moki Pueblos, northeastern Arizona, is in the faded spring pelage. The type and topotypes of *melanophrys* can be almost exactly matched in color by numerous specimens from Wingate, and even as far east as the Sandia Mountains, New Mexico.

In fresh pelage *O. l. melanophrys* is a handsome mouse, and it differs conspicuously in color from all the other races of *leucogaster*. It is most like *O. l. arcticeps* from the Great Plains, but is decidedly richer and darker colored.

*Specimens examined.*—Total number, 147, from localities as follows:

Utah: Bluff City, 2; Hanksville, 1; Kanab, 15, including the type; River View, 1; Thurber, 1.

Colorado: Antonito, 1; Conejos River, 2; Coventry, 1; Fruita, 5; Medano Ranch, 15 miles northeast of Mosca, 3; Naturita, 2.

Arizona: Flagstaff, 1; Holbrook, 8; Keams Cañon, 1; Moa Ave, Painted Desert, 4; Moki Pueblos, 3, including type of "*pallescens*"; Oraibi, 1; Tuba City, Painted Desert, 1; Walnut, 6; Winslow, 11; Zuni River, 2.

New Mexico: Acoma, 1; Albiquin, 6; Albuquerque, 1; Carasal, Bernalillo County, 2 (Mus. Comp. Zool.); Chaco Canyon, 2 (Amer. Mus.); Chama River, 1; Española, 1; Fruitland, 2; Gallina, 1; Gallup, 13; Jamez, 1; Laguna, 1; La Plata, 1 (Amer. Mus.); Sandia Mountains, 3; Santa Fe, 1; Stinking Spring Lake, 4; Tierra Amarillo, 1; Wingate, 32; Zuni River, 1.

### ONYCHOMYS LEUCOGASTER FULIGINOSUS Merriam.

1890. *Onychomys fuliginosus* MERRIAM, North Amer. Fauna, No. 3, p. 59. September 11.

*Type-locality.*—Black Tank lava beds, northeast of San Francisco Mountain, Arizona.

*Geographic distribution.*—Lava beds and pinyon and cedar belt, east and northeast of San Francisco Mountain, Arizona.

*General characters.*—Coloration very dark; characters otherwise as in *melanophrys*.

*Color.*—*Old adult in autumn* (17997, Black Tank, Arizona, September 27; type): Upperparts dark blackish brown; darkest on head and along middle of back to tail, where the color is almost deep neutral gray; sides lighter, more wood-brown; ear tufts not conspicuous, the color of head; outer sides of legs to foot color of back; tail blackish-brown above at base, paling to near end, which is white like the lower surface. Arms, hands, and feet whitish; underparts of body white. The color of upperparts extends downward on sides much farther than usual in the genus, leaving only the ventral surface pure white. *A younger adult* from the type-locality (17996, September 21) lacks most of the smoky coloration and is a rich dark wood-brown, mottled with blackish-brown, above; the legs are nearer white, as usual in the group, with only a faint indication of color along outer side to near heel. Three immature specimens also exhibit this variation in color and markings; two are like the type and one is like the last-described specimen.

*Skull.*—The skull does not differ in any essential respect from that of *melanophrys*.

*Measurements.*—Type: Total length, 160 millimeters; tail vertebræ, 47; hind foot, 21.5; ear from notch in dry skin, 15.0. Skull: Condylobasal length, 25.9; zygomatic breadth, 15.8; interorbital breadth, 5.2; breadth of braincase, 13.2; length of nasals, 11.6; length of mandible, 15.4; maxillary tooth row, 4.5. For detailed measurements of specimens, see page 477.

*Type-specimen.*—No. $\frac{17997}{24905}$, United States National Museum, Biological Survey collection. Skin and skull of old adult female (teeth much worn). Collected September 27, 1889, by Dr. C. Hart Merriam and Vernon Bailey. Original number, 547.

*Remarks.*—This is a local lava-bed form of *melanophrys*. Such local variations occur in other rodent genera, notably *Peromyscus* and *Neotoma*, in the "malpais" sections of Arizona and New Mexico. There is a question, perhaps, if such extreme local color variations should be recognized by name, but until more material from the vicinity of San Francisco Mountain is examined it seems best, in this case, to retain the form as a subspecies. Specimens of *melanophrys* from Walnut, Arizona, show a tendency toward *fuliginosus* in coloration and intergradation presumably takes place at all places where the lava-bed form meets the desert race.

*Specimens examined.*—Total number, 5, from the following localities:

ARIZONA: Black Tank, Painted Desert, 3, including the type; San Francisco Mountain, cedar belt, east side, 2.

### ONYCHOMYS LEUCOGASTER RUIDOSÆ Stone and Rehn.

1903. *Onychomys ruidosæ* STONE AND REHN, Proc. Acad. Nat. Sci. Philadelphia, 1903, p. 22. May 7.

1913. *Onychomys leucogaster ruidosæ* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 216. December 20.

*Type-locality.*—Hale's Ranch, Ruidoso, Lincoln County, New Mexico.

*Geographic distribution.*—Chiefly the mountainous region of southeastern Arizona and central and southwestern New Mexico. North to Camp Verde, Arizona, and to the Manzano Mountains and Las Vegas, New Mexico; east to the Capitan Mountains; south into northern Chihuahua and Sonora.

*General characters.*—A dark form of the *melanophrys* type; darker and richer colored than *melanophrys*, *arcticeps*, or *albescens*, its geographical neighbors; never, apparently, in its typical form, attaining the light buffy state of coloration.

*Color.*—*Adult in full fall pelage* (119149, Carrizozo, New Mexico, October 30): Above glossy dark wood-brown, with a wash of rich cinnamon color and finely lined with darker brown hair tips; darkest on lower back and rump, palest on shoulders and sides; posterior sides of body and hips almost pure cinnamon. Ear tufts pale cinnamon-brown, inconspicuous; ear brownish outside, rimmed with white; posterior side of inner ear with pure white hairs; tail grayish-brown above, whitish at tip and below. Lips, arms, hands, feet, and entire underparts whitish. *Juvenile* (119151, Carrizozo, New Mexico, October 31): Almost exactly like corresponding age in *O. l. longipes*, but tail lighter above, pale grayish-brown. *Young adult in autumn* (119152, Carrizozo, New Mexico, October 31): Paler and less richly colored than old animals. Above drab, very finely streaked with darker, and lightly washed with pale cinnamon.

Specimens collected during process of renewal into first full adult pelage are often curiously and irregularly mottled, with the head and dorsum dark brownish and the shoulders and sides patched with bright cinnamon.

*Skull.*—Less high and elongated than in *albescens* and *longipes;* much as in *arcticeps*, with flattened braincase. Differs from the skull of *arcticeps*, however, in its wider, less parallel sided, interpterygoid space and slightly smaller audital bullæ. (Plate 15.)

*Measurements.*—Averages and extremes of 21 adults from New Mexico and Arizona: Total length, 159 (150–167); tail vertebræ, 49 (42–55); hind foot, 22.2 (20.5–24.0); ear from notch in dry skin, 15.6 (13.7–16.9). Skull: Condylobasal length, 26.2 (24.9–27.5); zygomatic breadth, 14.8 (13.9–16.2); interorbital breadth, 4.8 (4.4–5.2); breadth of braincase, 12.8 (12.2–13.2); length of nasals, 11.2 (10.3–11.8); length of mandible, 15.3 (14.3–16.2); maxillary tooth row, 4.4 (4.3–4.6). For detailed measurements of specimens, see page 478.

*Type-specimen.*—No. 11091, collection of Academy of Natural Sciences, Philadelphia. Skin and skull of old adult female (teeth much worn). Collected September 19, 1898, by C. M. Barber. Original number, 73. Rhoads collection, No. 4091.

*Remarks.*—This is a dark form of the *melanophrys* type which seems never to attain the light buffy pelage of the more northern race. It is likewise darker and richer colored than *arcticeps.* Direct intergradation with *melanophrys, arcticeps,* and *albescens* is shown by numerous intermediate examples from the borders of the range. Specimens from Las Vegas, New Mexico, are approaching *arcticeps* in character. The lightest colored specimens I have referred to *ruidosæ* are from the Lower Sonoran parts of southern New Mexico, at Monument No. 15, Mexican Boundary Line, and Jarilla. These specimens show such a strong approach in color toward *albescens* of northern Chihuahua that their determination as *ruidosæ* seems perhaps unwarranted; but *albescens,* as known from three specimens only is so very local that until more complete collections from the general region are made it seems best to consider these specimens as intermediates, and probably nearest to *ruidosæ.*

*Specimens examined.*—Total number, 150, from the following localities:

NEW MEXICO: Ancho, 1; Bear Spring Mountains, 13; Burley, 4; Cactus Flat, 3; Capitan Mountains, 2; Carrizozo, 7; Datil Mountains, 2; Deer Creek, Grant County, 2; Deming, 8; Fairview, 2; Gallina Mountains, 4; Hale's Ranch, Ruidoso, 4 (Phila. Acad. Sci., type and two paratypes and one in Amer. Mus.); Hatchet Ranch, 1; Jarilla, 1; Lake Valley, 2; Las Vegas, 7; Magdalena, 1; Mangos Valley, 1; Manzano Mountains, east side, 11; Mesa Jumanes, 11; Mesilla, 1 (Phila. Acad. Sci.); Monument No. 15, Mexican Boundary Line, 5; Rio Alamosa, 1; San Augustine Plains, 7; San Pedro, 4; Socorro, 1.

ARIZONA: Camp Verde, 2; Dos Cabesos, 2; Fairbank, 4 (Amer. Mus. and Field Mus.); Lochiel, 1; San Bernardino Ranch, 1; San Pedro River, 23; Taylor, 5; Willcox, 1.

SONORA: Santa Cruz River, 4.

CHIHUAHUA: Colonia Diaz, 1.

### ONYCHOMYS LEUCOGASTER CAPITULATUS Hollister.

1913. *Onychomys leucogaster capitulatus* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 215. December 20.

*Type-locality.*—Lower end of Prospect Valley, 4,500 feet, Hualpai Indian Reservation, Grand Canyon, Arizona.

*Geographic distribution.*—Known only from the type-locality and from Aubrey Valley, Arizona.

*General characters.*—Darker than *melanophrys;* lighter, more reddish-brown, than *fuliginosus.* Coloration much like that of *ruidosæ,* but slightly smaller in size and with considerably smaller and weaker skull.

*Color.*—The coloration of this form, in all pelages, closely resembles that of *O. l. ruidosæ.*

*Skull.*—Like skulls of *ruidosæ* and *melanophrys,* but smaller and generally weaker, with lighter rostrum, narrower interpterygoid space, and smaller audital bullæ. (Plate 15.)

*Measurements.*—Type and averages of 10 adults from vicinity of type-locality, the latter in parentheses: Total length, 142 (147); tail vertebræ, 43 (44); hind foot, 21.0 (21.9); ear from notch in dry skin, 14.6 (14.8). Skull: Condylobasal length, 25.1 (25.1); zygomatic breadth, 14.0 (14.0); interorbital breadth, 4.7 (4.6); breadth of braincase, 13.0 (12.6); length of nasals, 10.9 (10.9); length of mandible, 14.5 (14.5); maxillary tooth row, 4.3 (4.3). For detailed measurements of specimens, see page 478.

*Type-specimen.*—No. 202612, United States National Museum, Biological Survey collection. Skin and skull of adult male (teeth moderately worn) in fresh fall pelage. Collected September 26, 1913, by Edward A. Goldman. Original number, 22234.

*Remarks.*—This form is closely related to *O. l. ruidosæ,* but the slightly smaller size, smaller ear, and uniformly smaller and weaker skull, characters so constant in the series of 20 specimens as to appear truly reliable, make it necessary to recognize it by name. No *Onychomys* was known from the region before this series was taken by Mr. Goldman in 1913, and the type-locality is the most westerly point of the known range of the *leucogaster* group in the Southwest.

*Specimens examined.*—Total number, 20, from localities as follows:

ARIZONA: Aubrey Valley, 10 miles south of Pine Spring, 6; Grand Canyon, Hualpai Indian Reservation, 14.

### ONYCHOMYS LEUCOGASTER ALBESCENS Merriam.

1904. *Onychomys leucogaster albescens* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

*Type-locality.*—Samalayuca, Chihuahua, Mexico.

*Geographic distribution.*—Known only from the sand dunes at the type-locality in northern Chihuahua, and from Monument No. 1, Mexican boundary line, opposite El Paso, Texas.

*General characters.*—General coloration exceedingly pale, without distinct markings, and with white of underparts extending onto shoulders and upper sides.

*Color.—Adult in full winter coat* (50040, Samalayuca, Chihuahua, December 12; type): General color of upperparts pale vinaceous-buff, darkest on crown, lower back, and rump, where the color becomes almost light pinkish-cinnamon; nose to crown whitish; ear tufts pure white; ears scantly furred with whitish; underfur of back slate-gray. Lips, cheeks, region back of ears, sides, legs, and feet white, the hairs everywhere except on upper sides pure white to bases. Tail pale-grayish above, whitish below; not sharply bicolor. Two slightly younger specimens from the type-locality differ somewhat from the type, but both are very pale. One (50042, December 18) lacks the buffy general color and is decidedly grayish above.

*Skull and teeth.*—The skull of *albescens* resembles those of *longipes* and *breviauritus* in general shape more than other forms of the group. Compared with *ruidosæ* it is long and slender with higher, less flattened braincase. The teeth are small.

*Measurements of type.*—Total length, 160 millimeters; tail vertebræ, 60; hind foot, 23; ear from notch in dry skin, 15.6. Skull: Condylobasal length, 26.0; zygomatic breadth, 14.2; interorbital breadth, 14.8; breadth of braincase, 12.9; length of nasals, 11.6; length of mandible, 15.0; maxillary tooth row, 4.3.

*Type-specimen.*—No. 50040, United States National Museum, Biological Survey Collection. Skin and skull of young adult male (teeth moderately worn and basal suture open), in fresh full winter coat. Collected December 12, 1892, by C. P. Streator. Original number 2399.

*Remarks.*—This is a local form, restricted, so far as known, to the sand dunes in the vicinity of Samalayuca, Chihuahua, and northward to the Rio Grande, opposite El Paso, Texas. Specimens from the Lower Sonoran deserts of Otero County, New Mexico, are pale and are distinctly approaching this race in color, but are best placed with the wider ranging *ruidosæ*.

*Specimens examined.*—Total number 6, from:

CHIHUAHUA: Mexican boundary line, opposite El Paso, 3; Samalayuca, 3 (type and paratypes).

### ONYCHOMYS LEUCOGASTER LONGIPES Merriam.

1888. *Cricetus* (*Onychomys*) *leucogaster* THOMAS, Proc. Zool. Soc. London, 1888, p. 445.

1889. *Onychomys longipes* MERRIAM, North Amer. Fauna, No. 2, p. 1. October 20.

1901. [*Onychomys leucogaster*] *longipes* ELLIOT, Field Col. Mus., pub. 45, zool. ser., vol. 2, p. 120.

1913. *Onychomys leucogaster longipes* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 216. December 20.

*Type-locality.*—Concho County, Texas.

*Geographic distribution.*—Central and southern Texas and Nuevo Leon and Tamaulipas, Mexico. North to Tom Green and Concho

Counties, Texas; west to the Pecos River; southeast to Rockport and Nueces Bay, Texas; south to Victoria, Tamaulipas. Lower Sonoran Zone.

*General characters.*—Size large; colors dull; ears larger than in any other subspecies of *leucogaster*. In general most like *breviauritus*, but much less brightly colored, lighter and grayer; with longer tail and feet and much larger ears.

*Color.*—*Adult in winter* (21180, Fort Clark, Texas, December 29): Upperparts drab, darkest on middle of back; finely lined with darker brownish, and with a wash of pale cinnamon over lower back and hips; an indistinct stripe of cinnamon along sides between color of upperparts and white of underparts, from fore legs to base of tail; a blackish spot each side of nose at base of whiskers; ear tufts scant, pale cinnamon color. Tail brown above with white tip; whitish below, not sharply bicolor. Underparts white, the hairs of throat and fore legs white to bases. There is little difference in the color of adults at any season. *Juvenile* (3863, Amer. Mus. Nat. Hist., Corpus Christi, Texas, April 24): Above brownish-gray, close to mouse-gray, finely lined with darker; sides paler.

*Skull and teeth.*—The skull of *longipes* resembles that of *breviauritus* and differs from the skulls of *arcticeps*, *melanophrys*, and other forms of *leucogaster* in being narrower and comparatively long, with longer, higher braincase. Teeth relatively small. (Plate 15.)

*Measurements.*—Averages and extremes of 12 adult specimens from Texas and Tamaulipas: Total length, 166 (152–190) millimeters; tail vertebræ, 55 (48–61); hind foot, 22.9 (22.0–25.0); ear from notch in dry skin, 16.1 (15.0–16.9). Skull: Condylobasal length, 27.1 (25.9–28.9); zygomatic breadth, 15.1 (14.3–15.5); interorbital breadth, 4.7 (4.5–5.2); breadth of braincase, 12.7 (11.9–13.3); length of nasals, 11.8 (10.9–12.7); length of mandible, 15.9 (15.1–17.1); maxillary tooth row, 4.4 (4.1–4.8). For detailed measurements of specimens see page 479.

*Type-specimen.*—No. 186478, United States National Museum. Skin and skull of young adult female (teeth little worn and basal suture not entirely closed). Collected March 11, 1887, by William Lloyd. Merriam collection, No. $\frac{3207}{3839}$.

*Remarks.*—This subspecies exhibits less variation in pelage from age and season than any other form of *Onychomys*. From lack of specimens between their ranges as mapped, intergradation with the Oklahoma form is not proved, but from the close resemblance between the two forms it seems most certain, and the Oklahoma form certainly intergrades with *arcticeps*. There are so few good specimens from the lower Pecos Valley that the actual relationship between *longipes* and *arcticeps* at this point can not be determined, but it seems most certain from the color of such skins as are available that intergradation does take place at this point. Aside from the slight difference in shape, there seem to be no actual characters to distinguish the skulls of *longipes* from those of other forms of the *leucogaster* group.

*Specimens examined.*—Total number, 39, from the following localities:

TEXAS: Bee County, 1; Brownsville, 1 (Amer. Mus.); Comstock, 3; Concho County, 1 (type); Corpus Christi, 1; Eagle Pass, 1; Fort Clark, 8; Laredo, 2; Lomita Ranch, 2; Nueces Bay, 3; Raglan's Ranch, Rio Grande, 1; Rockport, 2 (Amer. Mus.); San Angelo, 1; San Diego, 1; Sauz Ranch, Cameron County, 1; Sheffield, 25 miles south on Pecos River, 1; Sycamore Creek, 1.

TAMAULIPAS: Camargo, 2; Reynosa, 1; Victoria, 2.

NUEVO LEON: Linares, 3.

### ONYCHOMYS LEUCOGASTER BREVIAURITUS Hollister.

1913. *Onychomys leucogaster breviauritus* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 216. December 20.

*Type-locality.*—Fort Reno, Oklahoma.

*Geographic distribution.*—Eastern Nebraska, eastern and south-central Kansas, and middle Oklahoma. From Neligh, Nebraska, and Fort Riley and Neosha Falls, Kansas, west and south to Kinsley, Kansas, and to Woodward and Fort Reno, Oklahoma. Entirely within the Carolinian and Austroriparian faunas of the Austral region.

*General characters.*—Most like *O. l. longipes*, but darker and richer colored, with shorter tail, smaller hind foot, and smaller ears.

*Color.*—*Adult in full winter pelage* (96057, Alva, Oklahoma, February 27): Head and back a rich blackish-brown, the ground color pinkish-cinnamon, the overlying hairs with long blackish tips which streak and darken the ground color; cheeks and sides with less of the dark streaking, the hips and lower rump almost pure pinkish-cinnamon. Center of nose gray; cinnamon spots at base of whiskers, between the gray of nose and white of lips. Ear tufts cinnamon-buff; tail grayish-brown above to near tip, sharply bicolor, the underside and tip white. Arms, hands, lower legs, and entire underparts white, with dark gray underfur everywhere except on chin. *Adult in late summer* (19145, Fort Reno, Oklahoma, October 8; breeding female, renewal retarded): Upperparts dull grayish-brown; sides brighter, more cinnamon; no conspicuous ear tufts; tail and feet scantily furred. *Juvenile* (96060, Alva, Oklahoma, September 5): Above hair-brown, finely lined; sides paler, more drab; no ear tufts; tail brownish above, whitish below. *Immature in winter coat* (23190, Fort Reno, Oklahoma, December 21): Like the juvenile but darker, more glossy and richly colored; the back blackish-brown, sides more pinkish-buff; no ear tufts; tail brownish above, with white tip; entire underparts white.

*Skull.*—Almost precisely like the skull of *longipes*. Compared with skulls of *arcticeps* it is narrower, longer, and more arched, with longer rostrum and longer, higher braincase. I can find no character to separate the skulls from those of *longipes*. There is, perhaps, less tendency toward the development of a spine on the posterior border of the palate, but in the *leucogaster* group this character is exceedingly variable and very unreliable.

*Measurements.*—Type and averages, the latter in parentheses, of seven adults from Kansas and Oklahoma: Total length, 164 (156); tail vertebræ, 42 (42); hind foot, 21.0 (22.0); ear from notch in dry skin, 13.2 (12.8). Skull: Condylobasal length, 27.4 (26.9); zygomatic breadth, 15.1 (15.3); interorbital breadth, 4.4 (4.7); breadth of braincase, 12.5 (12.9); length of nasals, 11.5 (11.6); length of mandible, 15.9 (15.7); maxillary tooth row, 4.7 (4.6). For detailed measurements of specimens see page 479.

*Type-specimen.*—No. $\frac{18144}{34872}$, United States National Museum. Skin and skull of adult female (teeth moderately worn). Collected at Fort Reno, Oklahoma, February 16, 1890, by Dr. J. C. Merrill. Original number, 18.

*Remarks.*—This subspecies intergrades with *O. l. arcticeps*. Specimens from Paladora Canyon, Texas, though placed with *arcticeps*, are undoubtedly intermediates. Skulls of specimens from Neligh, Nebraska, show an approach toward skulls of *arcticeps* in a general shortening and flattening, but the skins are typical of *breviauritus*. Intergradation doubtless takes place also with *longipes*, which the Oklahoma form most resembles in general characters, but specimens to connect the ranges of the two subspecies throughout southern Oklahoma and north-central Texas are wanting.

*Specimens examined.*—Total number 41, from localities as follows:

NEBRASKA: Neligh, 8.

KANSAS: Fort Riley, 1; Neosha Falls, 1 (Mus. Comp. Zool.); Kinsley, 1.

OKLAHOMA: Alva, 17; Beaver River, 5 (Amer. Mus. and Field Mus.); Camp Supply, 1[1]; Fort Reno, 4; Neutral Strip, 1 (Amer. Mus.); White Horse Springs, 1 (Field Mus.); Woodward, 1.

### ONYCHOMYS TORRIDUS (Coues).

(Synonymy under subspecies.)

*Diagnosis.*—Compared with *Onychomys leucogaster*, this species averages smaller and lighter built, with relatively longer tail (usually more than half the length of head and body). The skull averages considerably smaller and less stoutly built, but with the interorbital region comparatively wide. The teeth are lower crowned, the unworn cusps of $m^1$ longer than high, or with these dimensions nearly equal; anterior cusp of $m^1$ more broadened transversely, in unworn condition plainly divided at summit into two or three cusplets; $m^1$ narrow and elongated; $m^3$ smaller, much reduced, the greatest diameter transverse, the crown surface usually only one-sixth to one-fourth that of $m^2$ (rarely nearly one-third); owing to the lengthening of $m^1$ and the reduction of $m^3$, $m^1$ is almost invariably more than half the length of the tooth row.

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[1] Skeleton only.

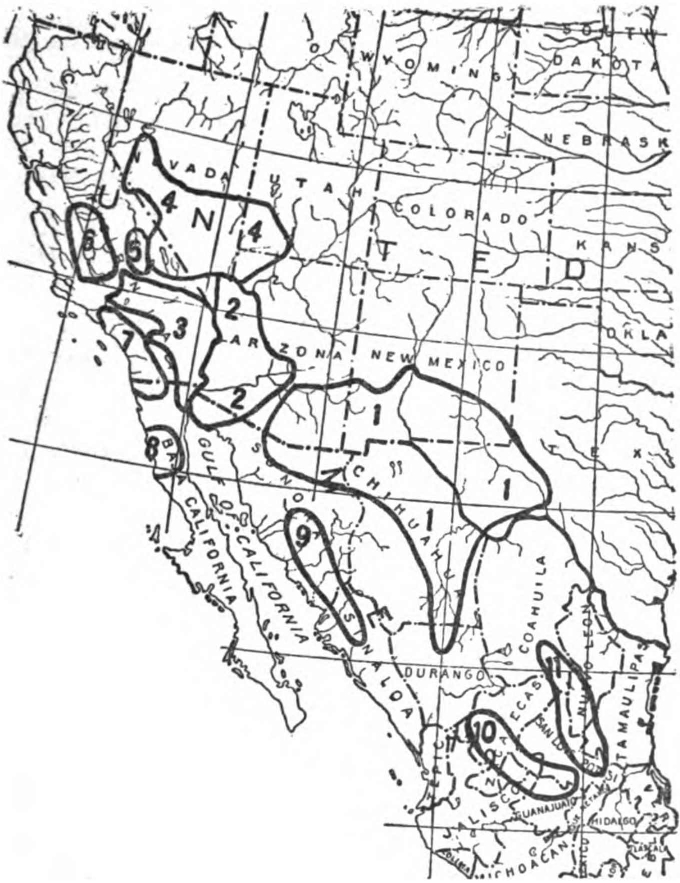

FIG. 3.—DISTRIBUTION OF THE SUBSPECIES OF ONYCHOMYS TORRIDUS.

1. O. t. torridus.
2. O. t. perpallidus.
3. O. t. pulcher.
4. O. t. longicaudus.
5. O. t. clarus.
6. O. t. tularensis.
7. O. t. ramona.
8. O. t. macrotis.
9. O. t. yakiensis.
10. O. t. canus.
11. O. t. surrufus.

*Geographic distribution.*—Southwestern United States and northern and central Mexico. From the deserts of Nevada and southeastern California and the San Joaquin Valley, south into Lower California and to Aguas Calientes and San Luis Potosi, Mexico. Eastward across southern Arizona and New Mexico to the Pecos Valley in Texas (see fig. 3).

*Subspecies.*—Eleven geographical races of *Onychomys torridus* are recognized. Four of these are confined to Mexico, and the others, with the exception of typical *torridus*, have comparatively limited distribution.

### ONYCHOMYS TORRIDUS TORRIDUS (Coues).

1874. *Hesperomys* (*Onychomys*) *torridus* Coues, Proc. Acad. Nat. Sci. Philadelphia, 1874, p. 183. December 15.

1885. *Onychomys leucogaster*, var. *torridus* Herrick, Geol. and Nat. Hist. Surv. Minnesota, 13th Ann. Rep. (1884), p. 183.

1885. *Hesperomys torridus* True, Proc. U. S. Nat. Mus., vol. 7 (1884), p. 597.

1888. *C*[*ricetus*] *torridus* Thomas, Proc. Zool. Soc. London, 1888, p. 133.

1889. *Onychomys torridus* Merriam, North Amer. Fauna, No. 2, p. 3. October 30.

1896. *Onychomys torridus arenicola* Mearns, Proc. U. S. Nat. Mus., No. 1103, advance sheet, p. 3, May 25; Proc. U. S. Nat. Mus., vol. 19, p. 139. (Rio Grande, about six miles above El Paso, Texas; type in U. S. Nat. Mus.)

1912. *Onychomys torridus torridus* Miller, Bull. 79, U. S. Nat. Mus., p. 128. December 31.

*Type-locality.*—Camp Grant, Graham County, Arizona.

*Geographic distribution.*—From the Pecos Valley in Texas and southeastern New Mexico, west across southern New Mexico and Chihuahua into southeastern Arizona and northern Sonora. North in the Rio Grande Valley to Socorro, New Mexico; south to northern Durango.

*General characters.*—Size medium, but less than in any neighboring form; ear smaller than in any other subspecies of *torridus*. Color of adult in late autumn and winter very rich reddish brown; much paler in late winter and spring; and darker, less bright, in the new coat in late summer; young very dark. Skull with the anterior palatine foramina large, extending backward to plane of anterior edge of $m^1$, or beyond to plane of second cusp of this tooth; posterior edge of palate normally concave, without projecting spine.

*Color.*—*Adult in full winter pelage* (17876, Dos Cabezos, Arizona, November 21): Upperparts dark pinkish-cinnamon, rich and glossy; palest on the nose and cheeks; darkest along back from between ears to rump, where it is considerably mixed with the dark blackish-brown tips of the long overlying hairs; purest and brightest on shoulders and sides where there is little or no admixture of blackish. Whiskers mixed black and white; underfur broadly dusky neutral-gray; lanuginous tufts in front of ears conspicuous, pure white; outer ear dark brownish, rimmed with whitish; inner side of ear scantily haired with whitish. Underparts pure white, sharply cut off from color of upperparts, and extending well up on lower sides of body and on lower cheeks; the underfur for one-half its length dark neutral-gray, black in some lights; arms and hands pure white; legs like hips above, white below; feet white. Tail sharply bicolor, grayish-brown above to near tip; white below and around tip. *Adult in late winter and spring* (21201, Mesquite Springs, Chihuahua, May 12): Much paler than in full winter coat, less reddish-cinnamon, more vinaceous or pale pinkish-gray and buff; the overlying hair tips worn or faded and the brownish-black wash on back and rump less conspicuous as a consequence; lanuginous ear tufts less contrasted from surrounding color and therefore much less conspicuous. *Adult in new pelage, late summer and fall* (21215, San Pedro River, Arizona, October 25): Darkest annual stage of adult. Pelage short, glossy, and with little red. Upperparts of head and body uniform wood brown, finely lined with darker; cheeks, shoulders, and sides very slightly paler, with less blackish-brown suffusion from darker hair tips; underfur broadly dark neutral-gray, the grayish-brown tips comparatively short; ear tufts wanting or inconspicuous, not noticeably contrasting in color from head. Underparts grayish-white, the slaty underfur showing through the thinly haired chest, belly, and limbs. Tail comparatively thinly haired, dark brown above, tip and underside whitish. *Juvenile pelage* (66085, Dos Cabezos, Arizona, June 22): Above uniform mouse-gray, the hair tips only slightly lighter than the underfur; ear tufts grayish; ears blackish outside, rimmed with white; dark brown inside, thinly haired with whitish. Underparts grayish-white; tail not sharply bicolor as in adult, the upper side gray, the under side and tip grayish-white. This juvenile pelage moults and renews directly into the post-juvenile pelage, which is worn until the following summer or autumn. *Post-juvenile pelage* (132056, Colonia Diaz, Chihuahua, January 19): Above browner, less slaty-gray, than in the juvenile coat. General color of upperparts grayish-hair-brown, with a decided tendency toward drab, finely lined with darker. Underparts clear whitish. Tail sharply bicolor, the brown line along upper surface very narrow.

*Skull.*—The skull, in general shape, is not conspicuously different from that of other forms of the *torridus* group. It is of medium size with comparatively narrow zygomatic breadth. The anterior palatine foramina are large, widely spreading forward of center, and extend backward to or beyond plane of anterior edge of $m^1$, usually fully to plane of second cusp of that tooth. The palate appears, therefore, very short, and this appearance is accentuated by the deeply concave posterior edge, normally without indication of spine. In occasional immature specimens from throughout the range of the form, and in many adults from the extreme western limits of its distribution in Arizona and Sonora, the posterior edge of the palate develops a well-formed spine, as in the neighboring races on the west and south. Skulls from these western localities show a still further approach toward *perpallidus* in the shortening of the anterior palatine foramina, though the skins from this region retain the high coloration of true *torridus*. (Plate 15.)

*Measurements.*—Averages and extremes of twenty-three specimens from Arizona, New Mexico, Sonora, and Chihuahua: Total length, 146 (134–158) millimeters; tail vertebræ, 52 (47–60); hind foot, 21.2 (20.0–22.0); ear from notch in dry skin, 14.0 (12.0–15.8). Skull: Condylobasal length, 23.3 (22.7–24.7); zygomatic breadth, 12.7 (11.9–13.7); interorbital breadth, 4.5 (4.3–4.8) breadth of braincase, 11.5 (11.0–11.9); length of nasals, 9.7 (8.9–10.4); length of mandible, 13.4 (12.6–14.1); maxillary tooth row, 3.7 (3.5–3.9). For detailed measurements of specimens see page 480.

*Type-specimen.*—No. 9886, United States National Museum. Skin only; adult, not sexed: made up from alcohol and colors considerately modified. Collected June 10, 1867, by Dr. Edward Palmer. Catalogued January, 1872. On the label are recorded the following: "Alcoholic measurements: nose to eye, .50 [hundredths of inch]; nose to ear, .95; nose to occiput, 1.25; length, 3.75; tail, 2.00; fore foot, .40; hind foot, .80; ear, .70 long, .50 wide." Ear from notch in the dry skin measures 13.3 millimeters; the hind foot, 19.7.

*Remarks.*—A comparison of numerous examples in the same pelage proves that *Onychomys torridus torridus* is remarkably uniform in coloration over its entire range. Skins in the full winter coat from Texas can be exactly matched by comparable skins from Dos Cabezos, Arizona. As noted in the description of the skull, specimens of *torridus* from the extreme western limits of the range of the typical race show a decided approach toward *perpallidus* in cranial characters, though retaining the coloration of *torridus* in its extreme richness. No specimens are available from the area between the northwestern limits of the distribution of *torridus*, as mapped, and Phoenix, Arizona, where *perpallidus* occurs, but the ranges of the two subspecies doubtless meet in this territory, as indicated by the approach of characteristics in specimens of each.

The type-specimen of *Onychomys torridus arenicola* Mearns, collected by Dr. Edgar A. Mearns and F. X. Holzner on the Rio Grande about 6 miles above El Paso, Texas, February 29, 1892, is in the collection of the United States National Museum. It is in the pale spring stage of the winter pelage and exactly matches some early April skins of true *torridus*. All late autumn and early winter skins from the El Paso region and throughout western Texas are indistinguishable in color from comparable skins of *torridus* from southeastern Arizona, and there are no important discrepancies in measurements or in cranial characters.

*Specimens examined.*—Total number, 183, from localities as follows:

ARIZONA: Calabasas, 5; Camp Grant, 1 (type); Dos Cabezos, 7; Fairbank, 20 (Field Mus., Amer. Mus., and Mus. Comp. Zool.); Fort Lowell, 13 (Field Mus. and Amer. Mus.); La Osa, 3; Mammoth, 2; Oracle, 1; San Bernardino Ranch, 3 (Field Mus. and Amer. Mus.); San Pedro River, 1; Santa Cruz River, 4; Tucson, 2; United States

Government grass reserve, 30 miles south of Tucson, 1 (Univ. of Calif.).

New Mexico: Alamogordo, 1 (Phila. Acad. Sci.); Apache, Grant County, 3; between Alamogordo and Dry Cañon, Sacramento Mountains, 7 (Phila. Acad. Sci.); Carizallilo Springs, 1; Dog Spring, 1; Dry Creek, 1; Eddy, 2; Glenwood, 4; Gold Camp, 1; Hillsboro, 1; Organ City, 1; Pleasanton, 4; Redrock, 2; San Andres Mountains, 1; Silver City, 2; Socorro, 3; Tularosa, 10; upper corner monument, Mexican boundary line, 9; Weed, 1.

Texas: Alpine, 5; El Paso, 1; Fort Lancaster, 6; Franklin Mountains, 1; Kent, 1; Marathon, 1; Marfa, 9; Maxon Springs, 1; Monahans, 4; Presidio County, 3; Rio Grande, 6 miles above El Paso, 1 (type of "*arenicola*"); Sierra Blanca, 11.

Chihuahua: Casas Grandes, 5; Chihuahua, 2; Colonia Diaz, 1; Gallego, 1; Juarez, 1 (Amer. Mus.); Mesquite Springs, 1; Samalayuca, 1.

Sonora: Cerro Blanco, 1 (Field Mus.); Magdalena, 3.

Durango: Indé, 1; Rio Sestin, 2 (Amer. Mus.); Rosario, 1 (Amer. Mus.); Villa Ocampo, 1 (Amer. Mus.).

### ONYCHOMYS TORRIDUS PERPALLIDUS Mearns.

1896. *Onychomys torridus perpallidus* Mearns, Proc. U. S. Nat. Mus., No. 1103, advance sheet, p. 4, May 25; Proc. U. S. Nat. Mus., vol. 19, p. 140.

*Type-locality.*—East bank of Colorado River, at Monument No. 204, Mexican Boundary Line, Yuma County, Arizona.

*Geographic distribution.*—Colorado River valley in western Arizona; eastward along tributary streams to Big Sandy Creek, Signal, and Phoenix. Doubtless occurs also in northwestern Sonora.

*General characters.*—Slightly larger than the neighboring forms, *torridus*, *longicaudus*, and *pulcher*, with larger ears. Coloration much as in *longicaudus*, but averaging considerably duller, less brightly pinkish-buff; paler than in *torridus*, darker than in *pulcher*. Skull always with well-developed spine from posterior edge of palate; the anterior palatine foramina ending about even with plane of fronts of first molars.

*Color.*—*Adult in full winter pelage* (189282, Dolan's Spring, Arizona, February 7): Decidedly paler, less richly colored, than corresponding pelage of *torridus*. General color of upperparts light pinkish-cinnamon, pure on cheeks, shoulders, and sides, and very sparingly and minutely streaked with darker on back and rump, lanuginous tufts in front of ears mixed with color of head and much less conspicuous than in *torridus;* underfur a much paler slate, in most lights about as in slate-gray No. 5 of Ridgway. Tail, feet, and underparts as in *torridus*, but the underfur below very narrowly pale slate, very different from the broadly grayish-black underfur of *torridus*. *Adult in late winter and spring* (60174, type, Yuma

County, Arizona, March 27): Paler and more grayish than in late autumn and midwinter, lacking much of the bright pinkish tint. General color of upperparts vinaceous-buff, finely streaked by the darker hair tips; ear tufts not noticeable. *Adult in summer* (16855, Phoenix, Arizona, May 9): Like late winter and spring specimens but more cinnamon colored, less grayish, chiefly due to the wearing away of the dark hair tips of the old pelage and the gradual renewal of the new hairs. This stage more closely resembles the full winter coat than the last described spring stage in color, but is more cinnamon, less pinkish. *Juvenile* (141849, Gila City, Arizona, March 3): Very much paler than the young of *torridus*, drab instead of gray. Upperparts light drab, paler and clearer on sides; underparts white [not gray as in juvenile of *torridus*], the hairs of throat pure white to bases, of breast and belly with narrow gray undercolor. *Post-juvenile pelage* (189288, Yuma, Arizona, April 11): This pelage is retained by most individuals until late spring of the second year. It is much like the post-juvenile pelage of true *torridus*, but slightly paler, more grayish. Upper parts avellaneous, finely and fully streaked by the darker hair tips.

*Skull.*—The skull is like that of *torridus*, but with the posterior border of palate bow-shape, always with well-developed point extending backward into the interpterygoid space; anterior palatine foramina shorter, usually just reaching plane of fronts of first molars.

*Measurements.*—Type: Total length, 157 millimeters; tail vertebræ, 57; hind foot, 22.0; ear from notch in dry skin, 15.8. Average and extremes of four skulls of adults: Condylobasal length, 24.1 (23.5–25.3); zygomatic breadth, 13.0 (12.7–13.2); interorbital breadth, 4.6 (4.4–4.7); breadth of braincase, 11.4 (11.3–11.5); length of nasals, 9.9 (9.4–10.5); length of mandible, 13.8 (13.5–14.2); maxillary tooth row, 3.8 (3.7–4.0). For detailed measurements of specimens see page 481.

*Type-specimen.*—No. 60174, United States National Museum. Skin and skull of adult female, in late winter pelage. Collected March 27, 1894, by Dr. Edgar A. Mearns and F. X. Holzner. No. 3301, International Boundary Commission collection.

*Remarks.*—This well-marked form seems to be confined to the east side of the Colorado River, in western Arizona, and eastward along the Lower Sonoran valleys of tributary streams. As shown by the specimens at hand, its range reaches its most eastern limit in the valley of the upper Gila at Phoenix, Arizona. Specimens from Phoenix, in full fresh early winter coat, almost exactly match in color the paler spring stage of true *torridus*. The Colorado River seems a natural barrier between the ranges of *perpallidus* on the east, and *pulcher* and *longicaudus* on the west and north. Although specimens from points near the river in northwestern Arizona and from Needles, California, may not be typical of their respective races, there is a decided break in size and in skull characters at this point, and every specimen so far examined can be placed unhesitatingly with its proper form. On the west side of the Colorado, at Needles, there is a decided reduction in size, accompanied by absence of the palatal spine, and the skins are colored much more like typical *pulcher* than true *perpallidus*. The specimens from east of the river (Fort Mojave, Beale's Spring, and Big Sandy Creek), are darker (slightly approaching typical *longicaudus* in color), but exhibit the cranial characters of *perpallidus*.

*Specimens examined.*—Total number, 21, from localities as follows:

ARIZONA: Beale's Spring, 3; Big Sandy Creek, 2; Colorado River at Monument 204, Mexican Boundary Line, 1 (type); Dolan's Spring, 1; Fort Mojave, 1; Gila City, 3; Harpers, 2; Parker, 1; Phoenix, 5; Signal, 1; Yuma, 1.

### ONYCHOMYS TORRIDUS PULCHER Elliot.

1903. *Onychomys pulcher* ELLIOT, Field Col. Mus., pub. 87, zool. ser., vol. 3, No. 14, p. 243. December.

1913. *O[nychomys] t[orridus] pulcher* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 215. December 20.

*Type-locality.*—Morongo Pass, San Bernardino Mountains, California.

*Geographic distribution.*—Mohave and Colorado Deserts, California, and Lower California, Mexico. Known by specimens from Granite Springs and Needles on the north to Seven Wells, Lower California, on the south; and from the Colorado River bottoms westward to Antelope Valley and through San Gorgonia Pass to Cabezon station.

*General characters.*—Size smallest in the genus. Coloration very pale, with minimum amount of dark wash from the hair tips. Skull with anterior palatine foramina about even with fronts of $m^1$ and with tendency toward development of an imperfect spine at posterior edge of palate.

*Color.*—*Adult in full winter pelage* (151281, Morongo Pass, California, November 23): Resembling corresponding pelage of *O. t. perpallidus* but slightly paler, with less dark overwash from hair tips; nose and head paler, more grayish; upper side of tail lighter grayish-brown; and general coloration more pinkish-cinnamon; lanuginous tufts at bases of ears white, sharply marked from general color of head. *Adult in spring and early summer* (151640, Victorville, California, April 5): Brighter and purer pinkish-cinnamon than in early winter coat, with still less dark from hair tips, evidently due to wear and fading. Entire upperparts light ochraceous-pinkish-cinnamon, slightly darker on lower back and rump; nose and forehead paler, more grayish; underparts pure white, the gray hair bases very narrow.

*Adult in summer molt* (54070, Whitewater, California, June 8): Much darker than in any other stage of pelage, and most resembling younger animals in the post-juvenile coat. The general color of the upperparts is greatly darkened by the thinning of the longer overlying hairs and the consequent mixture of the slaty-gray underfur into the coloration. Ear tufts not conspicuous. *Juvenile* (136227, Oro Grande, California, March 16): Resembling the young of *perpallidus*, but still paler, more grayish-drab, the nose and ears with more whitish. Very much paler than the dark young of *O. t. ramona*. *Post-juvenile pelage* (54072, Whitewater, California, June 9; apparently in second year): Upperparts uniformly silky pale wood-brown, with a wash of cinnamon on nape and shoulders; ear tufts white, conspicuous.

*Skull.*—The skull of *Onychomys torridus pulcher* does not differ in any special characters from other races. The anterior palatine foramina end about even with plane of fronts of $m^1$; the posterior edge of the palate is rather variable, sometimes slightly concave, usually truncate, often with imperfectly developed spine.

*Measurements.*—Averages and extremes of nine adults: Total length, 136 (120–145); tail vertebræ, 48 (37–51); hind foot, 19.6 (18.0–20.0); ear from notch in dry skin, 14.5 (12.7–15.5). Skull: Condylobasal length, 22.7 (22.0–23.4); zygomatic breadth, 12.7 (12.6–13.2); interorbital breadth, 4.7 (4.4–5.1); breadth of braincase, 11.6 (11.2–11.9); length of nasals, 9.3 (8.8–9.9); length of mandible, 13.2 (12.6–13.7); maxillary tooth row, 3.6 (3.3–3.9). For detailed measurements of specimens, see page 481.

*Type-specimen.*—No. 12377, Field Museum Natural History, Chicago. Skin and skull of female adult (teeth much worn), in late winter pelage. Collected March 1, 1903, by Edmund Heller.

*Remarks.*—This is a well marked race which differs conspicuously in color from typical examples of all other forms excepting *clarus*, which it somewhat resembles. It is, however, less intensely bright colored than the Owens Lake form. Specimens from Needles, California, are slightly larger than typical examples of *pulcher*, thus approaching the dimensions of *perpallidus* and *longicaudus*, but they are indistinguishable in color from true *pulcher* and are still somewhat smaller than the average specimen of *perpallidus*. A single specimen from Granite Springs, on the north side of the Mohave Desert, is likewise approaching *longicaudus*, but clearly belongs best with *pulcher*. The material from along the Colorado River is rather limited but, as shown by all the specimens examined, the river appears to be a natural barrier between the subspecies *pulcher* and *perpallidus*. The animal is rare on the open desert, and is usually found in sandy places along the foothills or borders of streams and washes. Its distribution over the desert is therefore much broken, and large areas of its general range are unrepresented by specimens. The subspecies apparently blends directly into *ramona* in the western end of San Gorgonio Pass, and probably intergrades with *tularensis* in the vicinity of Kern River Valley and Walker Pass. The single specimen from Onyx, on the south fork of the Kern River, is rather immature, and is indistinguishable from examples of *tularensis* from the lower levels in the San Joaquin Valley. Two young examples in the collection of the Museum of Vertebrate Zoology at the University of California, from Walker Pass, are likewise indistinguishable from specimens of the same age from the San Joaquin Valley, and are only provisionally on purely geographical grounds, and perhaps wrongly, placed with *pulcher*. Adults from this pass are much needed to determine the subspecies. The young of these forms, in post-juvenile pelage, are often very much alike.

*Specimens examined.*—Total number, 70, from the following localities:

CALIFORNIA: Agua Caliente, 1 (Amer. Mus.); Burns Cañon, San Bernardino Mountains, 2 (Field Mus.); Cabazon, 9; Cushenbury Springs, 2 (Univ. of Cal.); Daggett, 1 (Field Mus.); Fairmont, 3 (Univ. of Cal.); Granite Springs, 1; Lane's Mill, 20 miles north of Daggett, 1 (Field Mus.); Morongo Pass, 7[1]; Needles, 3; Onyx, 1; Oro Grande, 2; Palm Springs, 2 (Mus. Comp. Zool.); Victorville, 18; Walker Pass, 2 (Univ. of Cal.); Warren's Well, San Bernardino Mountains, 1 (Field Mus.); Whitewater, 13.

LOWER CALIFORNIA: Seven Wells, 1.

### ONYCHOMYS TORRIDUS LONGICAUDUS Merriam.

1889. *Onychomys longicaudus* MERRIAM, North Amer. Fauna, No. 2, p. 2. October 30.

1893. *O[nychomys] longicauda* RHOADS, Amer. Nat., vol. 27, p. 833. September.

1904. *O[nychomys] torridus longicaudus* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 123. June 9.

1913. *Onychomys torridus longicaudus* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 215. December 20.

*Type-locality.*—St. George, Utah.

*Geographic distribution.*—Southwestern Utah, northwestern Arizona north of the Colorado River, southern Nevada, and the adjacent desert mountain region of Inyo and Mono Counties, California. North in western Nevada to Carson Sink; west in California to Kearsarge Pass and to the Argus Mountains.

*General characters.*—Coloration like that of *pulcher*, but slightly darker. Larger than *perpallidus*, with shorter tail and hind foot, and smaller ear. Skull with anterior palatine foramina short, usually not reaching plane of front of first molars. Posterior edge of palate truncate, rarely slightly convex, never with spine.

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[1] Including the type and four paratypes from the Field Museum of Natural History, Chicago.

*Color.—Adult in full winter pelage* (186476, St. George, Utah, January 4; type): Similar to corresponding pelage of *perpallidus;* slightly darker than in *pulcher*. *Adult in spring* (28359, Panaca, Nevada, May 20): Like winter pelage, but brighter, more ochraceous-pinkish-buff. *Juvenile* (26653, Vegas Valley, Nevada, March 15): Very pale; like young of *pulcher*, but even paler, more drab-gray. *Post-juvenile pelage* (28360, Oasis Valley, Nevada, June 2; in second year): Almost precisely like corresponding pelage of *pulcher*.

*Skull.*—Palate never ending posteriorly with projecting spine; usually truncate, rarely concave. Anterior palatine foramina short, not reaching (or rarely in some intermediate specimens just reaching) plane of front of first molars.

*Measurements.*—Averages and extremes of 23 adults from Utah, Nevada, and California: Total length, 141 (130–155) millimeters; tail vertebræ, 49.6 (40.0–58.0); hind foot, 19.9 (19.0–21.0); ear from notch in dry skin, 14.2 (13.2–15.6). Skull: Condylobasal length, 22.8 (21.8–23.8); zygomatic breadth, 12.9 (12.7–13.3); interorbital breadth, 4.9 (4.5–5.0); breadth of braincase, 11.6 (11.1–12.2); length of nasals, 9.2 (8.6–9.9); length of mandible, 13.3 (12.5–14.2); maxillary tooth row, 3.6 (3.4–3.8). For detailed measurements of specimens see page 481.

*Type-specimen.*—No. 186476, United States National Museum. Skin and skull of adult male in full winter pelage. Collected by Vernon Bailey, January 4, 1889. Original No., 476; Merriam collection, skin 5201, skull 5896.

*Remarks.*—This subspecies is sharply separated from *perpallidus* on the south by the Colorado River. At the type-locality it is comparatively dark, and is virtually indistinguishable in color in some pelages from *perpallidus*, but the cranial characters are diagnostic and reliable. Toward the west it gradually becomes more ochraceous in color until it meets and blends with the Owens Lake form on the western slopes of the Argus Mountains. It also blends imperceptibly into the paler form later described as *pulcher*, in the mountains bordering the main Mohave Desert on the north.

*Specimens examined.*—Total number, 65, from the following localities:

UTAH: St. George, 3 (including the type).

NEVADA[1]: Ash Meadows, 2; Bunkerville, 2; Carson Sink, 2; Charleston Mountains, 2; Colorado River, southwest of Stone's Ferry, 2; Oasis Valley, 4; Pahranagat Valley, 1; Pahroc Spring, 3; Pahrump Valley, 8; Panaca, 1; St. Thomas, 2; Stone's Ferry, 1; Table Mountain, 1; Vegas Valley, 6.

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[1] For an account of most of the obscure localities in Utah, Nevada, and Inyo County, California, listed in this paper see a List of Localities Visited by the Death Valley Expedition, by T. S. Palmer, North American Fauna, No. 7, pp. 361–384.

CALIFORNIA: Amargosa, 1; Benton Station, 4 (Univ. of Cal.); Bishop, 2; Furnace Creek, Death Valley, 3; Independence, 2 (Univ. of Cal.); Kearsarge Pass, 2 (Univ. of Cal.); Maturango Spring, Argus Mountains, 1; Morans, upper Owens Valley, 1; Panamint Mountains, 4; Panamint Valley, 1; Resting Springs, 4.

### ONYCHOMYS TORRIDUS CLARUS Hollister.

1913. *Onychomys torridus clarus* HOLLISTER, Proc. Biol. Soc. Washington, vol. 26, p. 215. December 20.

*Type-locality.*—Keeler, east shore of Owens Lake, Inyo County, California.

*Geographic distribution.*—Vicinity of Owens Lake, Coso Mountains, and Salt Wells Valley, Inyo County, California.

*General characters.*—Like *Onychomys torridus longicaudus*, but clearer and brighter colored, with very little dark streaking from the hair tips. Resembling *O. t. pulcher*, but much more intensely pinkish-cinnamon. Skull as in *longicaudus*, but with anterior palatine foramina averaging longer, reaching backward fully to line of fronts of first molars.

*Color.*—*Adult in full winter coat* (25081, Keeler, California, November 30): Upperparts bright pinkish-cinnamon, palest on nose and head and most intense and glossy on lower back and rump, with very little or no darker admixture from the hair tips. Underfur dark neutral-gray; hairs with subapical band of buff, tipped with deep cinnamon. Ears very thinly haired, narrowly rimmed with brown; woolly tufts at bases creamy-white, comparatively inconspicuous. Nose, cheeks, lower sides, limbs, hands, feet, and underparts white, the underfur narrowly neutral-gray. Tail whitish, with narrow, indistinct stripe of grayish-brown along upper side for two-thirds its length. *Adult in late winter and spring* (28199, Hot Springs Valley, California, May 7): Paler, more pinkish-buff, the dark cinnamon hair tips worn or faded. *During the summer moult* (28127, Owens Lake, California, May 18) the adults are much darker, with very little bright cinnamon, and with considerable admixture of darker color from the gray underfur and the faded, now brownish, hair tips. *Juvenile* (28195, Olancha, California, June 30): Indistinguishable in color from the young of *pulcher*.

*Skull.*—The skull closely resembles that of *longicaudus*. The posterior end of the palate is always without projecting spine; the anterior palatine foramina average longer than in *longicaudus*, reaching quite to plane of fronts of first molars. (Plate 15.)

*Measurements.*—Type and average of six adults from the type region, the latter in parentheses: Total length, 143 (141) millimeters; tail vertebræ, 51 (51.4); hind foot, 20.5 (19.7); ear from notch in dry skin, 15.7 (14.8). Skull: Condylobasal length, 23.3 (23.0);

zygomatic breadth, 13.2 (12.8); interorbital breadth, 4.9 (4.8); breadth of braincase, 11.6 (11.7); length of nasals, 9.5 (9.3); length of mandible, 13.2 (13.3); maxillary tooth row, 3.7 (3.6). For detailed measurements of specimens, see page 482.

*Type-specimen.*—No. $\frac{25453}{32867}$, United States National Museum, Biological Survey collection. Adult male (teeth considerably worn) in full winter pelage. Collected December 30, 1890, by Vernon Bailey. Original number, 2314.

*Remarks.*—In the immediate vicinity of Owens Lake, the *Onychomys* of the *longicaudus* type develops its brightest coloration, with the minimum of admixture of any darker streaking from the hair tips. The animals from this region are so decidedly different in color from specimens of typical *longicaudus*, and occupy such a definite, though limited, range that the form represented requires recognition by name. It resembles *pulcher* in the purity of the color, but is decidedly richer and brighter colored. The intensity of the coloration in this region parallels that of several other species of rodents.

*Specimens examined.*—Total number, 21, from the following localities:

CALIFORNIA: Coso Mountains, 2 (Field Mus.); Hot Springs Valley, 2; Keeler, 8; Lone Pine, 3; Olancha, Owens Lake, 6.

### ONYCHOMYS TORRIDUS TULARENSIS Merriam.

1904. *Onychomys torridus tularensis* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 123. June 9.

1905. *Onychomys longicaudus tularensis* ELLIOT, Field Col. Mus., zool. ser., vol. 6, p. 132.

*Type-locality.*—Bakersfield, Kern County, California.

*Geographic distribution.*—Upper San Joaquin Valley and neighboring foothills and valleys, California. North to Little Panoche Creek, San Benito County; south to Carriso Plain and Bakersfield.

*General characters.*—Color of upper parts grayish-drab; very different from adults of any other form found in the United States, and most resembling *O. t. canus* of Mexico. Posterior edge of palate not conspicuously concave, frequently convex, but never with distinct spine.

*Color.*—*Adult in full winter pelage* (151339, Little Panoche Creek, California, December 11): Upperparts light drab, slightly washed with a pinkish cast, and everywhere finely lined with the dark brown of the hair tips; upper face darker, ashy-gray. Between the color of the back and the white of the lower sides is a narrow, indefinite stripe of light pinkish-buff, clearest and most sharply marked posteriorly. The underfur is of a lighter gray than in the neighboring subspecies; the lanuginous tufts at ear bases are grayish-white and barely noticeable; arms, hands, lower sides of legs and of tail, lower sides, and entire underparts white, the hairs of chin and throat white to bases; rest of underparts with narrow undercolor of gray. Tail sharply bicolor; grayish-brown above, whitish below, with whitish tip. *Adult in summer* (149793, Stanley, California, July 1): Upperparts grayish-cinnamon, with little luster and with considerable admixture of gray from the underfur; upper face dark ashy. *Juvenile* (129968, Santiago Springs, California, July 30): Lighter colored than young of *ramona;* darker, more ashy, than young of *longicaudus* or *pulcher*. Upperparts, including legs above to ankles, ecru-drab, finely streaked and darkened by the blackish hair tips; below whitish, the hairs barely darkened to a pale grayish-white at bases. *Post-juvenile pelage* (128409, Santiago Springs, California, August 14): General color above light drab, less ashy than in the juvenile, and without the pinkish cast of old adults; upper face not darker than back. This pelage is apparently worn until late in the second summer.

*Skull.*—Anterior palatine foramina about reaching plane of fronts of first molars. Posterior edge of palate never distinctly concave, but normally truncate, and frequently convex, but with no distinct spine projecting into interpterygoid space.

*Measurements.*—Averages and extremes of four adults: Total length, 144 (141–148) millimeters; tail vertebræ, 52.3 (51–54); hind foot, 20.8 (20.0–22.0); ear from notch in dry skin, 14.6 (14.0–15.1). Skull: Condylobasal length, 23.5 (23.2–24.0); zygomatic breadth, 12.9 (12.5–13.3); interorbital breadth, 4.7 (4.5–4.9); breadth of braincase, 11.6 (11.3–11.8); length of nasals, 9.2 (8.9–9.5); length of mandible, 13.4 (13.1–13.7); maxillary tooth row, 3.7 (3.5–3.8). For detailed measurements of specimens see page 482.

*Type-specimen.*—No. $\frac{29711}{41786}$, United States National Museum, Biological Survey collection. Skin and skull of female young adult (teeth slightly worn); moulting the post-juvenile pelage and renewing into first fall pelage of adult, probably second summer. Collected July 19, 1891, by Dr. A. K. Fisher. Orig. No. 792.

*Remarks.*—The adults of this form differ conspicuously in color from adults of all the neighboring subspecies of *torridus*. The San Joaquin grasshopper mouse is a decidedly grayish-drab colored race, becoming slightly more cinnamon or ochraceous in faded summer coat, before the moult. The differences in seasonal pelage are much less than in any other of the northern races, and are not so readily definable.

*Specimens examined.*—Total number, 20, from localities as follows:

CALIFORNIA: Alcalde, 1; Alila, 2; Bakersfield, 1 (type); Carriso Plains, 1; Coalinga, 1; Delano, 1; Famoso, 1; Huron, 2; Little Panoche Creek, 1; McKittrick, 1 (Univ. of Calif.); Santiago Springs, 2; Stanley, 2; Weldon, 4 (Univ. of Calif.).

### ONYCHOMYS TORRIDUS RAMONA Rhoads.

1893. *Onychomys ramona* RHOADS, Amer. Nat., vol. 27, p. 833. September.

1904. *Onychomys torridus ramona* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

*Type-locality.*—San Bernardino Valley, California.

*Geographic distribution.*—Extreme southwestern California and northwestern Lower California, Mexico. From San Fernando and San Bernardino south into Tecarte Valley.

*General characters.*—Size slightly greater than in *O. t. pulcher;* coloration very dark, the darkest of all the forms of the *torridus* group found in the United States; skull like that of *pulcher.*

*Color.*—*Adult in full winter pelage* (126063, Mouth of Tia Juana River, California, January 18): Nose, head, and broad area along upperparts to base of tail blackish-brown; sides of body and outer sides of hind limbs to ankles brighter, more reddish-brown, with less admixture from dark hair tips; ear tufts mixed brown and whitish, not especially conspicuous; underparts creamy-white, the hairs of chin and throat without grayish undercolor. Tail blackish-brown above, whitish at tip and below. *Adult in early summer* (127979, Reche Canyon, California, May 24): Lighter, more reddish, than in winter, without definite dark area on dorsum, the blackish-brown hair tips having faded and worn away. The most extreme example of this stage that I have seen is number 7376 of the Museum of Vertebrate Zoology, University of California, from Jacumba, March 19. It is the brightest specimen of *ramona* in all the collections, and most resembles specimens of true *torridus* in full winter pelage. *Juvenile pelage* (34090, San Diego, California, May 10): Darker than young of *pulcher,* more mouse-gray above. *Post-juvenile pelage* (31075, Reche Canyon, September 22; apparently in second year): Upperparts light drab, darker, more grayish, on head and lower back.

*Skull.*—The skull is apparently indistinguishable from that of *O. t. pulcher.* (Plate 15.)

*Measurements.*—Averages and extremes of 10 adult specimens: Total length, 141 (137–148) millimeters; tail vertebræ, 49.5 (36–56); hind foot, 20.3 (19.0–21.0); ear from notch in dry skin, 14.7 (14.2–15.4). Skull: Condylobasal length, 23.4 (22.6–23.8); zygomatic breadth, 13.2 (12.7–13.7); interorbital breadth, 4.8 (4.6–5.0); breadth of braincase, 11.8 (11.4–12.3); length of nasals, 9.7 (9.2–10.1); length of mandible, 13.6 (13.2–14.0); maxillary tooth row, 3.6 (3.4–3.7). For detailed measurements of specimens see page 482.

*Type-specimen.*—No. 7823, collection of Academy of Natural Sciences, Philadelphia. Skin and skull of female adult (teeth considerably worn), in early summer stage of pelage, with dark dorsal area nearly obsolete and general color considerably paled. Collected April 11, 1893, by R. B. Herron. Original number, 218 (Rhoads collection, No. 823).

*Remarks.*—This well-marked subspecies is the darkest of the races of *torridus* found in the United States. It intergrades directly with *pulcher* in the west end of San Gorgonio Pass. The specimens from Tia Juana River and Tecarte Valley show an approach in size to *O. t. macrotis* of Lower California peninsula.

*Specimens examined.*—Total number, 60, from localities as follows:

CALIFORNIA: Banner, 1 (Univ. of Calif.); Burbank, 1; Dulzura, 2 (Phila. Acad. Sci.); Ferndale, San Bernardino County, 2 (Mus. Comp. Zool.); Jacumba, 3; La Puerta Valley, 1 (Univ. of Calif.); mouth of Tia Juana River, 5; Pasadena, 1 (Univ. of Calif.); Reche Canyon, 4; Riverside, 9; San Bernardino Valley, 15 (including the type and paratypes, Phila. Acad. Sci.); San Diego, 1; San Fernando, 1; San Jacinto Lake, 1; Santee Mountains, 3; Tujunga Valley, 1 (Univ. of Calif.); Valle Vista, San Jacinto Valley, 4 (Univ. of Calif.); Warner Pass, 2 (Univ. of Calif.).

LOWER CALIFORNIA: Tecarte Valley, 3.

### ONYCHOMYS TORRIDUS MACROTIS Elliot.

1903. *Onychomys macrotis* ELLIOT, Field Col. Mus., pub. 74, zool. ser., vol. 3, No. 10, p. 155. April.

*Type-locality.*—Head of San Antonio River, west slope of San Pedro Martir Mountains, Lower California, Mexico.

*Geographic distribution.*—From the San Pedro Martir and southern Hanson Laguna Mountains west to the Pacific coast, Lower California, Mexico.

*General characters.*—Like *Onychomys torridus ramona* but larger, with longer tail and hind foot, and especially larger ears.

*Color.*—Not distinguishable from that of *Onychomys torridus ramona.*

*Skull.*—The skull of *macrotis* is like that of *O. t. ramona,* but larger. (Plate 15.)

*Measurements.*—Type and an adult female from San Quintin, Lower California, the latter in parentheses: Total length, 155 (148) millimeters; tail vertebræ, 55 (54); hind foot, 21 (22); ear from notch in dry skin, 16.7 (16.8). Skull: Condylobasal length, 24.3 (24.7); zygomatic breadth, 13.3 (13.5); interorbital breadth, 4.9 (5.0); breadth of braincase, 11.7 (11.8); length of nasals, 10.3 (10.1); length of mandible, 14.1 (14.2); maxillary tooth row, 3.7 (3.7). Average external measurements of eight specimens from San Quintin, compared with averages of eight skins of *ramona,* the latter in parentheses: Tail vertebræ, 52.4 (47.0); hind foot, 21.1 (20.1); ear from notch in dry skin, 16.6 (14.5).

*Type-specimen.*—No. 10283, Field Museum of Natural History, Chicago. Skin and skull of female adult (teeth considerably worn). Collected March 11, 1902, by Edmund Heller.

*Remarks.*—The recorded measurements give little idea of the great size of the ear as compared with that of *ramona.* Except for increase in general size and relative, as well as actual, increase in the size of the ear, *macrotis* is very like *ramona*, with which it most certainly intergrades.

*Specimens examined.*—Total number, 22, from localities as follows:

Lower California: El Alamo, 1 (Field Mus.); Head of San Antonio River, San Pedro Martir Mountains, 1 (Field Mus., the type); San Quintin, 18; Trinidad, 1 (Field Mus.); Trinidad Valley, 1.

### ONYCHOMYS TORRIDUS YAKIENSIS Merriam.

1904. *Onychomys torridus yakiensis* Merriam, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

1904. *Onychomys yakiensis* Merriam, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

*Type-locality.*—Camoa, Rio Mayo, southern Sonora, Mexico.

*Geographic distribution.*—Southeastern Sonora and northern Sinaloa, Mexico. Known from the upper Rio Mayo on the north to the city of Sinaloa on the south.

*General characters.*—Like *O. t. torridus*, but larger and averaging darker in color, with larger ears and hind foot. Skull with posterior border of palate never concave, rarely truncate, usually with well-developed spine projecting into interpterygoid space.

*Color.—Adult in full early winter pelage* (96384, Alamos, Sonora, December 19): Like corresponding pelage of true *torridus*, but slightly darker and duller above, less rich pinkish-cinnamon; upper sides clear pinkish-cinnamon as in *torridus;* ears darker, thinly haired, with very narrow whitish rim, and no conspicuous white lanuginous tufts at bases as in *torridus*. Tail slightly grayish on terminal half below, brown above with whitish tip. *In late winter and spring* (96391, Camoa, Sonora, January 17) this pelage becomes darker, less bright, with large area of dull brown on upperparts and with the sides more grayish-pink, less cinnamon. *Adult in short new coat of late summer* (95855, Camoa, Sonora, October 28; type): Upperparts with broad strip of blackish-brown from between eyes to rump, blending into the dark pinkish-gray of sides and hips; cheeks and shoulders paler; no specially developed ear tufts. *Juvenile* (95853, Camoa, Sonora, October 28): Darker mouse-gray than young of *torridus*. This very dark stage soon changes into a lighter coat, apparently from fading of the hairs and without moult. In this stage (96383, Alamos, Sonora, December 19) the entire upperparts are a pale drab-gray, slightly darker on dorsum, against which the dark-gray ears are very conspicuous in color. *Post-juvenile pelage* (95856, Camoa, Sonora, October 28; apparently second autumn): Upperparts dark brownish-gray, washed with dark rusty; ears blackish, without lanuginous tufts at bases. This pelage moults and renews into the coat of the fully adult (96388, Alamos, Sonora, December 20), the hips and posterior sides first renewing the brownish pelage of full maturity; the white ear rim also becomes sharply marked.

*Skull and teeth.*—Skull larger than in *torridus*, with longer mandible. The posterior border of the palate is never concave as in *torridus;* it is rarely truncate, but usually with a very well-developed spine projecting into the interpterygoid space. The anterior palatine foramina are large, well bowed, and extend backward to line of the second cusps of first molars. The posterior palatine foramina are also especially large, open, and three times as long as wide. The teeth, as in all the middle Mexican forms, average larger than in the northern races. (Plate 15.)

*Measurements.*—Averages and extremes of seven adult specimens from Camoa and Alamos, Sonora: Total length, 149 (138–156) millimeters; tail vertebræ, 53.0 (47–57); hind foot, 22.4 (21.5–24.0); ear from notch in dry skin, 16.0 (15.2–17.8). Skull: Condylobasal length, 24.0 (22.4–25.4); zygomatic breadth, 13.2 (12.4–13.5); interorbital breadth, 4.5 (4.3–4.6); breadth of braincase, 11.8 (11.4–12.2); length of nasals, 9.9 (9.1–10.6); length of mandible, 14.3 (12.8–15.1); maxillary tooth row, 3.9 (3.8–4.0). For detailed measurements of specimens, see page 483.

*Type-specimen.*—No. 95855, United States Nat. Museum, Biological Survey collection. Skin and skull of female adult (teeth moderately worn), in short fall pelage. Collected October, 28, 1898, by E. A. Goldman. Original number, 13158.

*Remarks.*—Except for its large size and larger ears, *yakiensis* is externally much like true *torridus*. The skull differs greatly from typical *torridus* in the shape of the posterior border of the palate. In the presence of the palatal spine it shows approach toward the somewhat aberrant specimens of *torridus* from the western limits of the range of the latter, in the vicinities of Tucson and La Osa, Arizona, and at Magdalena, Sonora.

*Specimens examined.*—Total number, 19, from localities as follows:
SONORA: Alamos, 7; Camoa, Rio Mayo, 11 (including the type).
SINALOA: Sinaloa, 1.

### ONYCHOMYS TORRIDUS CANUS Merriam.

1904. *Onychomys torridus canus* MERRIAM, Proc. Biol. Soc. Washington, vol. 17, p. 124. June 9.

*Type-locality.*—San Juan Capistrano, Zacatecas, Mexico.

*Geographic distribution.*—Zacatecas, Aguas Calientes, and southwestern San Luis Potosi, Mexico; south and east to Rio Verde, San Luis Potosi.

*General characters.*—Closely related to *O. t. yakiensis*, but differing greatly in color; less bright cinnamon or brownish, more pinkish-gray. Greatly resembles in color the San Joaquin Valley form, *O. t. tularensis*. Seasonal changes in pelage very slight.

*Color.*—*Adult in full winter pelage* (82102, Rio Verde, San Luis Potosi, January 13): Upperparts wood-brown, everywhere washed with pale pinkish-cinnamon, giving a general color of "grayish-brown"; no distinct dorsal color area, the upper side uniform with back. Ears dark, thinly haired, the tufts at bases buffy and gray, inconspicuous; tail dark brown above, grayish-white below; feet very thinly haired with whitish. Underparts grayish-white, the underfur mixing with and darkening the general color from the white hair tips. *Adult in new short coat of late summer* (90840, Hda. San Juan Capistrano, Zacatecas, August 20): Darker, more blackish-brown on middle back and rump; the sides slightly paler pinkish-gray.

*Skull.*—As in *yakiensis*, but palate with less regularly well developed spine, sometimes concave as in true *torridus*. Posterior palatine foramina smaller.

*Measurements.*—Averages and extremes of six adults: Total length, 150 (146–153) millimeters; tail vertebræ, 52.8 (42–58); hind foot, 21.9 (21.0–23.0); ear from notch in dry skin, 16.0 (15.2–17.1). Skull: Condylobasal length, 24.0 (23.5–24.9); zygomatic breadth, 12.8 (12.4–13.2); interorbital breadth, 4.5 (4.4–4.8); breadth of braincase, 11.8 (11.6–12.0); length of nasals, 10.2 (9.8–10.7); length of mandible, 13.8 (13.5–14.1); maxillary tooth row, 3.7 (3.6–3.9). For detailed measurements of specimens, see page 483.

*Type-specimen.*—No. 90843, United States National Museum, Biological Survey collection. Skin and skull of female adult (teeth moderately worn). Collected August 23, 1897, by E. W. Nelson and E. A. Goldman. Original number, 11574.

*Remarks.*—In the comparative uniformity of color throughout the year, this subspecies differs greatly from the more northern forms of *Onychomys torridus*, in which the variations from age and season are so remarkable. The color resemblance of some adults to certain examples of *O. t. tularensis* is very striking. As shown by a small series of skins from northern Durango, which, though somewhat intermediate, have been placed with *O. t. torridus*, this form blends directly into the latter subspecies on the north. Typically, however, it most resembles *O. t. yakiensis*.

*Specimens examined.*—Total number, 14, from the following localities:

ZACATECAS: Hda. San Juan Capistrano, 5 (including the type).
AGUAS CALIENTES: Chicalote, 1.
SAN LUIS POTOSI: Jesus Maria, 2; Rio Verde, 6.

### ONYCHOMYS TORRIDUS SURRUFUS new subspecies.

*Type-locality.*—Miquihuana, Tamaulipas, Mexico.

*Geographic distribution.*—East side of the Mexican table-land, in extreme southeastern Coahuila, southern Nuevo Leon, and southwestern Tamaulipas.

*General characters.*—Largest of the *torridus* group. Coloration in new coat more reddish than in *canus*, approaching that of *torridus* proper. Skull as in *canus*, but slightly larger, with larger audital bullæ.

*Color.—Adult in left-over winter coat* (93829, Jaumave, Tamaulipas, June 3): Most like summer skins of *canus*, but with more pinkish suffusion over entire upperparts, and sides brighter pale pinkish-cinnamon. *Adults in process of moult* (93837, Miquihuana, Tamaulipas, June 8) are frequently very dark; the dark gray underfur is exposed in patches and the light hair tips are almost completely worn or faded away; rusty areas are irregular, from retarded moult or from renewal. *Adult in new coat* (93839, type Miquihuana, Tamaulipas, June 8; renewal not complete): Upperparts dark glossy pinkish-cinnamon, much resembling *O. t. torridus* in similar coat, but ear tufts color of head, not white, and tail above much darker brown.

*Skull.*—Like skull of *O. t. canus*, but averaging slightly larger, with larger audital bullæ. Anterior palatine foramina reaching plane of second cusp of first molars; posterior border of palate usually ending in large spine. (Plate 15.)

*Measurements.*—Type and averages of 11 adults from Jaumave and Miquihuana, Tamaulipas, the averages in parentheses: Total length, 163 (155) millimeters; tail vertebræ, 62 (59.4); hind foot, 22.5 (22.1); ear from notch in dry skin, 16.8 (16.7). Skull: Condylobasal length, 25.0 (24.4); zygomatic breadth, 13.6 (13.1); interorbital breadth, 4.6 (4.8); breadth of braincase, 11.8 (10.8); length of nasals, 10.3 (10.1); length of mandible, 14.6 (14.0); maxillary tooth row, 3.8 (3.9). For detailed measurements of specimens, see page 483.

*Type-specimen.*—No. 93839, United States National Museum, Biological Survey collection. Skin and skull of female adult (teeth much worn), renewing into fresh pelage. Collected June 8, 1898, by E. W. Nelson and E. A. Goldman. Original number, 12484.

*Remarks.*—This is the largest subspecies of *Onychomys torridus*. It slightly exceeds *O. t. canus* in size, with relatively longer tail. In faded summer coat it greatly resembles *canus*, but is distinguishable by the longer tail and the slight cranial characters. As shown by a single specimen in a more advanced state of renewal than is usual in early summer skins, the fresh coat is much as in true *torridus*, a rich, dark pinkish-cinnamon. This form seems to be confined to the eastern side of the Mexican table-land, and doubtless intergrades directly into true *torridus*. Like all the more southern forms it is distinguishable from *torridus* by its larger size and much larger ears.

*Specimens examined.*—Total number, 17, from localities as follows:

COAHUILA: La Ventura, 1.

TAMAULIPAS: Jaumave, 5; Miquihuana, 11.

*Measurements of fully adult specimens of the Onychomys leucogaster group.*

| Locality. | Number. | Sex. | Total length. | Tail vertebræ. | Hind foot. | Ear from notch. | Skull: Condylobasal length. | Zygomatic breadth. | Interorbital breadth. | Breadth of brain case. | Length of nasals. | Length of mandible. | Maxillary tooth row. | Condition of molar teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *O. l. leucogaster.* | | | | | | | | | | | | | | |
| North Dakota: | | | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | |
| Hankinson | 180025 | Female | 168 | 38 | 22.0 | 14.4 | 27.9 | 16.3 | 4.5 | 13.3 | 12.3 | 17.8 | 4.4 | Much worn. |
| Do | 180027 | Male | 165 | 42 | 22.0 | 13.8 | 28.0 | 17.3 | 4.7 | 13.4 | 11.5 | 16.8 | 4.6 | Do. |
| Devils Lake | 55462 | do | 160 | 47 | 22.0 | 14.2 | 26.2 | 15.1 | 4.7 | 13.2 | 10.5 | 15.9 | 4.5 | Moderately worn. |
| *O. l. missouriensis.* | | | | | | | | | | | | | | |
| Alberta: Calgary | 69043 | Female | 145 | 36 | 21.0 | 12.6 | 25.8 | 14.9 | 4.5 | 12.9 | 11.0 | 15.9 | 3.9 | Much worn. |
| Montana: | | | | | | | | | | | | | | |
| Robare | 67511 | Male | 141 | 35 | 20.0 | 14.4 | 25.4 | 15.1 | 4.6 | 13.3 | 10.4 | 14.9 | 4.3 | Moderately worn. |
| Mountain Sheep Buttes | 161394 | Female | 150 | 36 | 20.0 | 15.4 | 26.2 | 14.9 | 4.6 | 13.1 | 10.9 | 15.7 | 4.3 | Much worn. |
| Johnson Lake | 169681 | do | ...... | ...... | ...... | 13.3 | 26.6 | 15.5 | 4.9 | 13.3 | 11.0 | 15.9 | 4.4 | Do. |
| Bozeman | 161395 | do | 146 | 29 | 21.0 | 14.7 | 26.2 | 15.7 | 4.8 | 13.3 | 11.0 | 15.7 | 4.6 | Do. |
| Fort Custer | 75735 | do | 151 | 40 | 21.0 | 14.2 | 26.3 | 15.1 | 4.6 | 13.0 | 11.0 | 15.4 | 4.6 | Moderately worn. |
| Wyoming: Little Powder River | 65868 | do | 160 | 43 | 20.0 | 14.5 | 25.7 | 14.9 | 4.8 | 13.5 | 11.0 | 15.5 | 4.6 | Much worn. |
| North Dakota: | | | | | | | | | | | | | | |
| Buford | 168549 | Male | 149 | 44 | 21.0 | 13.7 | 26.0 | 16.0 | 4.7 | 13.6 | 11.0 | 15.4 | 4.2 | Do. |
| Do | 168551 | do | 141 | 41 | 21.5 | 12.7 | 25.9 | 15.4 | 4.8 | ...... | 10.7 | 15.7 | 4.6 | Do. |
| Do | 168548 | Female | 155 | 45 | 21.5 | 14.6 | 26.6 | 15.7 | 4.8 | 12.9 | 10.9 | 15.7 | 4.4 | Moderately worn. |
| Do | 189242 | do | 161 | 45 | ...... | 15.8 | 26.3 | ...... | 4.8 | 13.2 | 10.9 | 15.8 | 4.4 | Do. |
| *O. l. arcticeps.* | | | | | | | | | | | | | | |
| South Dakota: | | | | | | | | | | | | | | |
| Smithville | 65666 | do | 154 | 41 | 21.0 | 13.9 | 25.7 | 14.4 | 4.5 | 12.7 | 11.2 | 15.4 | 4.8 | Much worn. |
| Buffalo Gap | 189255 | Male | 146 | 37 | 19.0 | 12.7 | 25.5 | 14.8 | 4.5 | 12.7 | 11.2 | ...... | 4.8 | Do. |
| Nebraska: | | | | | | | | | | | | | | |
| Niobrara River | [illegible] | do | 140 | 39 | 19.0 | 13.2 | 27.0 | 14.9 | 4.5 | 13.1 | 11.8 | 15.9 | 4.8 | Moderately worn. |
| Cherry County | [illegible] | do | 140 | 41 | 20.0 | 12.8 | 25.5 | 15.4 | 4.6 | 13.2 | 10.8 | 15.4 | 4.3 | Do. |
| Do | [illegible] | do | 154 | 40 | 21.0 | 12.4 | 26.4 | 16.2 | 4.5 | 13.4 | 11.5 | 15.8 | 4.7 | Much worn. |
| Do | [illegible] | do | 134 | 34 | 20.5 | 13.2 | 25.8 | 15.7 | 4.4 | 12.8 | 11.2 | 15.5 | 4.5 | Do. |
| Do | [illegible] | do | 144 | 39 | 20.0 | 12.7 | 26.6 | 15.7 | 4.4 | 12.4 | 12.1 | 15.6 | 4.4 | Do. |
| Do | [illegible] | Female | 161 | 47 | 21.0 | 13.7 | 25.9 | ...... | 4.4 | ...... | 10.4 | 15.2 | 4.3 | Do. |
| Do | [illegible] | do | 139 | 39 | 20.0 | 12.7 | 26.0 | 15.4 | 4.5 | 13.1 | 11.8 | 15.8 | 4.4 | Do. |
| Do | [illegible] | do | 166 | 47 | 22.0 | 13.8 | 27.1 | 16.3 | 4.5 | 13.2 | 11.6 | 16.0 | 4.7 | Do. |
| Kennedy | 116312 | do | 160 | 38 | 22.5 | 13.9 | 26.4 | 15.5 | 4.2 | 12.8 | 11.0 | 15.7 | 4.7 | Do. |
| Valentine | 189260 | Male | 151 | 36 | 22.0 | 12.8 | 25.7 | 15.9 | 4.5 | 13.4 | 10.4 | 15.2 | 4.5 | Do. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Do. | [illegible] | Female | 162 | 41 | 21.5 | 12.8 | 26.8 | 15.7 | 4.3 | 12.7 | 11.6 | 15.9 | 4.7 | Do. |
| Do. | 189258 | ...do... | 159 | 39 | 20.0 | 14.4 | 26.1 | 15.4 | 4.5 | 13.2 | 11.5 | 16.2 | 4.7 | Do. |
| Thomas County | [illegible] | ...do... | 131 | 37 | 18.5 | 12.7 | 25.7 | 15.4 | 4.6 | 13.0 | 10.4 | 15.3 | 4.6 | Moderately worn. |
| Do. | [illegible] | ...do... | 136 | 38 | 19.5 | 12.7 | 25.9 | 15.4 | 4.7 | 13.0 | 12.2 | 15.4 | 4.8 | Much worn. |
| Birdwood Creek | [illegible] | ...do... | 139 | 39 | 19.0 | 13.3 | 25.3 | 15.4 | 4.5 | 13.1 | 10.9 | 14.6 | 4.5 | Do. |
| Myrtle | [illegible] | ...do... | 144 | 37 | 20.0 | 12.8 | 26.0 | 14.8 | 4.6 | 12.6 | 10.9 | 14.8 | 4.6 | Moderately worn. |
| Kansas: | | | | | | | | | | | | | | |
| Trego County | 189267 | Male | ...... | ...... | ...... | 13.6 | 26.9 | 15.1 | 4.6 | 13.5 | 11.7 | 15.7 | 4.5 | Do. |
| Pendennis | 87663 | ...do... | ...... | ...... | ...... | 13.4 | 26.7 | 14.8 | 4.5 | 12.8 | 11.0 | 15.4 | 4.8 | Much worn. |
| Do. | 87665 | ...do... | ...... | ...... | ...... | 14.8 | 27.7 | 16.6 | 4.6 | 13.4 | 11.8 | 16.8 | 4.4 | Do. |
| Do. | 87666 | ...do... | ...... | ...... | ...... | 13.8 | 27.1 | 16.2 | 4.8 | 13.7 | 11.9 | 16.3 | 4.4 | Do. |
| Do. | 87664 | Female | ...... | ...... | ...... | 12.5 | 26.8 | 15.5 | 4.5 | 12.7 | 11.3 | 16.2 | 4.5 | Do. |
| Wyoming: | | | | | | | | | | | | | | |
| Saratoga | 171476 | Male | 141 | 35 | 20.0 | 14.4 | 24.8 | 14.8 | 4.8 | 13.0 | 10.8 | 15.0 | 4.4 | Do. |
| Do. | 176465 | Female | 146 | 40 | 20.0 | 15.4 | 24.8 | 14.9 | 4.5 | 13.2 | 10.9 | 15.0 | 4.3 | Do. |
| Mountainview | 179116 | ...do... | 139 | 37 | 20.0 | 15.6 | 25.3 | 15.3 | 4.8 | 12.9 | 10.8 | 15.1 | 4.4 | Do. |
| Kemmerer | 178937 | Male | 140 | 39 | 19.0 | 15.2 | 25.7 | 15.6 | 4.7 | 13.5 | 10.5 | 15.5 | 4.2 | Moderately worn. |
| Kinney Ranch | 88298 | ...do... | 138 | 33 | 20.0 | 15.0 | 25.9 | 15.4 | 5.1 | 12.7 | 10.5 | 15.4 | 4.2 | Much worn. |
| Fort Bridger | [illegible] | Female | 146 | 40 | 20.0 | 15.0 | 24.6 | 14.8 | 4.5 | 12.8 | 10.3 | 14.2 | 4.4 | Do. |
| Bridger Pass | [illegible] | Male | 144 | 38 | 20.0 | 15.4 | 24.9 | 15.2 | 4.7 | 13.2 | 10.2 | 15.4 | 4.2 | Do. |
| Do. | [illegible] | Female | 145 | 42 | 21.0 | 14.5 | 25.1 | 14.8 | 4.7 | 13.2 | 10.5 | 14.8 | 4.8 | Moderately worn. |
| Colorado: | | | | | | | | | | | | | | |
| Lay | 138244 | Male | 146 | 38 | 21.0 | 14.8 | 25.8 | 14.7 | 5.1 | 12.7 | 10.8 | 15.4 | 4.2 | Much worn. |
| Canadian Creek | 138241 | ...do... | 143 | 35 | 20.5 | 15.2 | 25.3 | 15.2 | 4.7 | 12.9 | 10.9 | 15.3 | 4.1 | Do. |
| Do. | 138242 | Female | 144 | 38 | 20.0 | ...... | 24.9 | 15.0 | 4.8 | 13.2 | 10.8 | 15.2 | 4.5 | Do. |
| Sterling | [illegible] | ...do... | 170 | 48 | 23.0 | 14.2 | 26.7 | 15.8 | 4.8 | 13.2 | 11.3 | 15.9 | 4.5 | Do. |
| Loveland | 69361 | ...do... | 165 | 49 | 23.0 | 14.4 | 27.0 | 15.7 | 4.8 | 13.6 | 10.6 | 16.0 | 4.7 | Do. |
| Do. | 69367 | ...do... | 155 | 45 | 22.0 | 13.7 | 26.7 | 14.8 | 4.7 | 12.6 | 10.6 | 15.4 | 4.8 | Do. |
| Greeley | 87908 | ...do... | ...... | ...... | ...... | 13.6 | 25.8 | 15.4 | 4.4 | 12.7 | 10.1 | 15.6 | 4.4 | Moderately worn. |
| Limon | 69856 | ...do... | 139 | 41 | 21.5 | 12.9 | 24.5 | 14.4 | 4.9 | 12.7 | 10.6 | 14.9 | 4.5 | Do. |
| Las Animas | [illegible] | Male | 170 | 53 | 22.0 | 13.9 | 27.3 | 16.1 | 4.8 | 13.1 | 11.4 | 16.4 | 4.3 | Do. |
| Salida | 150984 | ...do... | 149 | 47 | 22.0 | 14.0 | 25.9 | 15.0 | 4.8 | 12.7 | 11.2 | 15.1 | 4.3 | Do. |
| New Mexico: | | | | | | | | | | | | | | |
| Santa Rosa | 127300 | ...do... | 145 | 38 | 24.0 | 15.8 | 25.7 | 14.6 | 4.6 | 12.4 | 11.4 | 14.8 | 4.7 | Do. |
| Do. | 119227 | Female | 170 | 56 | 21.0 | 16.0 | 26.2 | 15.7 | 4.4 | 12.8 | 11.7 | 15.6 | 4.4 | Much worn. |
| Do. | 127299 | ...do... | 152 | 42 | 22.0 | 14.8 | 25.6 | 13.9 | 4.8 | 12.5 | 11.4 | 15.6 | 4.3 | Moderately worn. |
| Roswell | 119247 | Male | 161 | 51 | 22.0 | 14.9 | 26.1 | 14.5 | 4.6 | 13.0 | 11.6 | 15.1 | 4.5 | Much worn. |
| Do. | 119249 | ...do... | 155 | 50 | 22.0 | 14.2 | 26.5 | 15.2 | 4.8 | 13.2 | 10.9 | 15.4 | 4.4 | Do. |
| Texas: | | | | | | | | | | | | | | |
| Texline | 128226 | Female | 166 | 46 | 22.0 | 13.8 | 27.0 | 14.8 | 5.0 | 13.0 | 11.3 | 14.7 | 4.4 | Do. |
| Lipscomb | 127846 | Male | 158 | 42 | 22.0 | 13.0 | 27.5 | 15.8 | 4.7 | 12.9 | 11.5 | 16.2 | 4.7 | Moderately worn. |
| Hereford | 109092 | ...do... | 150 | 40 | 19.0 | 13.3 | 25.9 | ...... | 4.6 | 12.9 | 11.8 | 15.2 | 4.4 | Do. |
| *O. l. brevicaudus.* | | | | | | | | | | | | | | |
| Idaho: | | | | | | | | | | | | | | |
| Blackfoot | [1] [illegible] | ...do... | 139 | 38 | 19.5 | 15.4 | ...... | 14.6 | 5.0 | 13.0 | 10.1 | 14.6 | 4.0 | Much worn. |
| Minidoka | 169572 | ...do... | 138 | 36 | 19.0 | 15.7 | 24.5 | ...... | 5.1 | 12.8 | 9.4 | 14.0 | 4.1 | Do. |
| Do. | 169575 | ...do... | 136 | 33 | 17.0 | 15.5 | 24.9 | 14.2 | 4.7 | 12.7 | 10.0 | 14.4 | 3.9 | Do. |
| Do. | 169574 | Female | 135 | 31 | 17.0 | 15.7 | 24.8 | 14.6 | 4.9 | 13.1 | 10.3 | 13.9 | 3.9 | Do. |
| Utah: Nephi | 75689 | ...do... | 155 | 42 | 20.0 | 15.7 | 26.0 | ...... | 5.0 | 12.4 | 9.8 | 14.9 | 3.9 | Do. |

[1] Type.

*Measurements of fully adult specimens of the Onychomys leucogaster group*—Continued.

| Locality. | Number. | Sex. | Total length. | Tail vertebræ. | Hind foot. | Ear from notch. | Skull: Condylobasal length. | Zygomatic breadth. | Interorbital breadth. | Breadth of brain case. | Length of nasals. | Length of mandible. | Maxillary tooth row. | Condition of molar teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *O. l. brevicaudus*—Continued. | | | | | | | | | | | | | | |
| Nevada: | | | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | |
| Carson Sink | 156861 | Male | 148 | 45 | 21.0 | 15.7 | 24.8 | 14.7 | 4.8 | 12.6 | 10.3 | 14.5 | 4.1 | Moderately worn. |
| Halleck | 54594 | ...do | 136 | 38 | 19.0 | 15.4 | 24.1 | 14.5 | 5.0 | 12.6 | 9.8 | 13.9 | 4.2 | Much worn. |
| Do | [illegible] | Female | 130 | 40 | 20.0 | 15.2 | 23.8 | 13.4 | 4.7 | 12.5 | 10.0 | 14.2 | 4.2 | Moderately worn. |
| Elko | 94666 | ...do | 149 | 39 | 19.0 | 16.2 | ...... | 13.7 | 4.7 | 12.8 | 9.5 | 14.4 | 4.1 | Do. |
| Osobb Valley | 93451 | ...do | 144 | 39 | 20.0 | 16.1 | 25.1 | 14.6 | 5.0 | 13.3 | 10.5 | 14.6 | 4.0 | Much worn. |
| Do | 93452 | ...do | 145 | 38 | 20.0 | 15.8 | 25.4 | 14.8 | 5.0 | 12.4 | 10.2 | 14.8 | 4.2 | Do. |
| Austin | 93454 | Male | 141 | 40 | 20.0 | 16.2 | 25.2 | 14.1 | 4.8 | 12.7 | 10.2 | 14.3 | 4.2 | Moderately worn. |
| Do | 93455 | ...do | 146 | 42 | 20.0 | 16.3 | 25.7 | 14.5 | 5.1 | 12.9 | 10.2 | 15.0 | 4.1 | Much worn. |
| Reese River | [illegible] | ...do | 138 | 40 | 20.0 | 14.4 | 24.3 | 14.4 | 5.1 | 13.1 | 9.9 | 14.2 | 4.2 | Moderately worn. |
| Monitor Valley | 94154 | ...do | 131 | 38 | 18.0 | 14.5 | 24.0 | 13.8 | 5.0 | 12.3 | 9.7 | 13.7 | 3.9 | Much worn. |
| Silver Creek | 32311 | ...do | 146 | 41 | 19.0 | 15.8 | 25.3 | 14.6 | 5.0 | 12.9 | 10.0 | 15.0 | 4.0 | Moderately worn. |
| Golconda | 94667 | Female | 153 | 42 | 19.0 | 16.7 | 24.6 | 14.0 | 4.8 | 12.6 | 10.0 | 14.2 | 3.8 | Much worn. |
| Mountain City | 94662 | Male | 141 | 38 | 19.0 | 15.2 | 25.0 | 14.7 | 5.1 | 12.9 | 10.1 | 14.7 | 3.9 | Do. |
| California: Mono Lake | 109543 | Female | 138 | 43 | 20.0 | 15.9 | 24.5 | 14.0 | 4.9 | 12.7 | 10.2 | 13.8 | 4.2 | Moderately worn. |
| *O. l. fuscogriseus.* | | | | | | | | | | | | | | |
| Washington: | | | | | | | | | | | | | | |
| Coulee City | 89716 | Male | 141 | 39 | 20.0 | 15.1 | 24.6 | 12.6 | 4.8 | 12.4 | 9.8 | 14.4 | 4.0 | Moderately worn. |
| Baird | 149059 | ...do | 143 | 35 | 18.5 | 15.0 | 25.2 | 14.5 | 4.6 | 12.9 | 10.3 | 14.5 | 4.1 | Do. |
| Do | 149060 | Female | 138 | 39 | 18.0 | 15.8 | 24.8 | 14.2 | 4.9 | 12.6 | 10.0 | 14.2 | 4.0 | Do. |
| Pasco | [illegible] | ...do | 144 | 40 | 19.0 | 14.5 | 24.6 | 14.0 | 4.9 | 12.5 | 9.9 | 14.2 | 4.2 | Much worn. |
| Oregon: | | | | | | | | | | | | | | |
| Buck Creek | 78640 | Male | 140 | 34 | 19.0 | 14.8 | 24.4 | 14.4 | 5.0 | 12.9 | 10.2 | 14.7 | 4.0 | Do. |
| Plush | 78875 | Female | 149 | 41 | 19.0 | 14.5 | 25.1 | 14.0 | 4.8 | 12.4 | 10.3 | 14.9 | 4.2 | Moderately worn. |
| California: Madeline Plains | 88959 | ...do | 147 | 40 | 21.0 | 15.3 | 25.2 | 15.0 | 4.6 | 12.9 | 10.1 | 14.9 | 4.4 | Do. |
| *O. l. melanophrys.* | | | | | | | | | | | | | | |
| Utah: | | | | | | | | | | | | | | |
| Kanab | 161200 | Male | 156 | 46 | 22.5 | 15.0 | 25.7 | 15.3 | 4.8 | 12.5 | 11.3 | 15.9 | 4.7 | Much worn. |
| Do | 161201 | ...do | 160 | 51 | 22.0 | 14.8 | 26.0 | 15.0 | 4.9 | 12.7 | 11.2 | 15.5 | 4.7 | Moderately worn. |
| Do | [1]186477 | ...do | 154 | 41 | 21.0 | 14.4 | 25.8 | 15.6 | 5.0 | 12.8 | 11.0 | 15.0 | 4.7 | Do. |
| Do | 169276 | ...do | 150 | 42 | 21.0 | 14.7 | 25.9 | 15.3 | 5.3 | 13.0 | 10.5 | 15.1 | 4.6 | Do. |
| Hanksville | 157965 | Female | 145 | 39 | 21.5 | 13.9 | 24.8 | ...... | 4.8 | 12.8 | 10.3 | 14.8 | 4.5 | Much worn. |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bluff City | 57201 | Male | ...... | ...... | ...... | 14.9 | 26.2 | 14.8 | 4.9 | 12.3 | 11.1 | 14.8 | 4.8 | Moderately worn. |
| Do | 57202 | ...do | ...... | ...... | ...... | 15.3 | 26.1 | 14.1 | 5.2 | 12.8 | 11.0 | 15.2 | 4.6 | Do. |
| Colorado: | | | | | | | | | | | | | | |
| Fruita | 148222 | ...do | 149 | 40 | 22.0 | 14.1 | 25.6 | 15.2 | 5.2 | 13.1 | 10.4 | 15.3 | 4.4 | Do. |
| Do | 148225 | Female | 149 | 41 | 22.0 | 14.2 | 25.8 | 14.8 | 4.7 | 12.4 | 11.0 | 15.2 | 4.5 | Do. |
| Coventry | 151410 | Male | 153 | 40 | ...... | 15.4 | 27.3 | 16.1 | 5.3 | 13.1 | 11.4 | 15.9 | 4.6 | Do. |
| Conejos River | 133711 | Female | 156 | 55 | 22.0 | 15.4 | 25.7 | 15.0 | 5.0 | 13.0 | 11.3 | 15.8 | 4.4 | Much worn. |
| Medano Ranch | 150983 | ...do | 163 | 49 | 23.0 | 14.8 | 25.8 | 14.5 | 4.9 | 12.4 | 10.6 | 15.7 | 4.7 | Moderately worn. |
| Arizona: | | | | | | | | | | | | | | |
| Moa Ave | [illegible] | ...do | 150 | 46 | 21.5 | 14.2 | 25.6 | 14.4 | 5.0 | 12.4 | 11.0 | 15.2 | 4.8 | Do. |
| Moki Pueblos | [2] 186479 | Male | ...... | ...... | 22.0 | 15.2 | 27.2 | 15.3 | 4.6 | 12.7 | 11.8 | 16.0 | 4.5 | Do. |
| Walnut | 53563 | ...do | 150 | 46 | 22.0 | 16.1 | 25.9 | 15.0 | 4.9 | 12.9 | 11.3 | 15.1 | 4.5 | Much worn. |
| Do | 53558 | Female | 160 | 47 | 22.0 | 15.1 | 26.1 | 14.7 | 4.7 | 12.2 | 11.7 | 14.6 | 4.5 | Moderately worn. |
| Do | 53559 | ...do | 158 | 49 | 22.5 | 15.9 | 26.5 | 15.2 | 5.0 | 13.2 | 11.4 | 15.4 | 4.7 | Do. |
| Do | 53560 | ...do | 160 | 46 | 23.0 | 14.8 | 26.6 | ...... | 4.6 | 13.1 | 11.3 | 15.6 | 4.4 | Much worn. |
| Do | 53561 | ...do | 152 | 45 | 22.0 | 15.4 | 25.4 | ...... | 4.9 | 13.2 | 11.7 | 15.2 | 4.5 | Do. |
| Winslow | 53553 | Male | 156 | 48 | 22.0 | 15.0 | 26.5 | 14.4 | 4.8 | 12.7 | 11.6 | 15.2 | 4.4 | Moderately worn. |
| Do | 53555 | ...do | 167 | 50 | 24.0 | 16.3 | 27.0 | 16.1 | 5.2 | 13.7 | 11.3 | 16.0 | 4.5 | Do. |
| Do | 161197 | Female | 171 | 54 | 21.0 | 16.3 | 26.8 | 14.7 | 4.9 | 13.5 | 11.6 | 16.4 | 4.3 | Much worn. |
| Do | 167415 | ...do | 168 | 51 | 21.5 | ...... | 25.9 | 15.0 | 4.8 | 12.8 | 11.7 | 15.4 | 4.3 | Do. |
| Holbrook | 53313 | ...do | 165 | 50 | 24.0 | 15.9 | 27.4 | 15.2 | 5.0 | 12.9 | 12.1 | 15.7 | 4.5 | Moderately worn. |
| Apache County | 189274 | ...do | ...... | ...... | ...... | 15.8 | 25.9 | 14.5 | 4.6 | 12.4 | 11.4 | 14.3 | 4.4 | Much worn. |
| New Mexico: | | | | | | | | | | | | | | |
| Gallup | 137497 | Male | 160 | 45 | 21.5 | 16.0 | 26.9 | 15.9 | 5.1 | 12.9 | 12.2 | 15.6 | 4.8 | Moderately worn. |
| Do | 137499 | ...do | 165 | 44 | 22.0 | 16.3 | 26.5 | 15.8 | 5.0 | 12.7 | 11.3 | 15.8 | 4.7 | Much worn. |
| Do | 137574 | ...do | 169 | 47 | 22.5 | 16.8 | 26.8 | 15.8 | 5.1 | 13.1 | 11.7 | 15.6 | 4.8 | Do. |
| Do | 158443 | ...do | 159 | 46 | 21.0 | 15.3 | 26.0 | 14.8 | 4.8 | 12.7 | 11.5 | 14.8 | 4.6 | Moderately worn. |
| Do | 137576 | Female | 179 | 47 | 22.5 | 17.1 | 28.7 | 16.7 | 5.1 | 13.2 | 12.2 | 16.8 | 4.6 | Much worn. |
| Wingate | 137411 | Male | 168 | 44 | 23.5 | 16.5 | 27.5 | 16.1 | 5.1 | 12.8 | 11.8 | 15.9 | 4.6 | Do. |
| Do | 137425 | ...do | 167 | 53 | 22.0 | 16.1 | 26.8 | 16.2 | 5.3 | 12.7 | 10.9 | 15.5 | 4.6 | Do. |
| Do | 137400 | Female | 178 | 51 | 23.0 | 16.1 | 27.6 | 15.9 | 5.0 | 12.9 | 11.8 | 16.5 | 4.8 | Do. |
| Do | 137402 | ...do | 178 | 52 | 22.0 | 16.8 | 26.9 | 15.7 | 4.8 | 12.6 | 12.0 | 15.7 | 4.7 | Do. |
| Do | 137403 | ...do | 179 | 46 | 22.5 | 16.2 | 28.2 | 15.5 | 5.1 | 13.1 | 12.3 | 16.1 | 4.5 | Do. |
| Do | 137404 | ...do | 168 | 45 | 22.0 | 15.7 | 26.8 | 16.2 | 4.9 | 13.4 | 11.3 | 15.2 | 4.7 | Do. |
| Do | 137409 | ...do | 172 | 46 | 23.0 | 16.8 | 27.3 | 15.9 | 5.0 | 13.2 | 11.3 | 16.0 | 4.9 | Do. |
| Do | 137412 | ...do | 166 | 45 | 22.0 | 17.2 | 27.1 | 15.9 | 4.9 | 13.2 | 11.6 | 15.9 | 4.9 | Moderately worn. |
| Do | 137413 | ...do | 169 | 44 | 23.0 | 16.9 | 27.3 | 16.0 | 4.9 | 12.9 | 11.5 | 15.9 | 4.7 | Much worn. |
| Do | 137419 | ...do | 165 | 48 | 22.0 | 16.6 | 27.1 | 15.3 | 5.1 | 13.1 | 11.5 | 15.2 | 4.7 | Moderately worn. |
| Do | 137420 | ...do | 176 | 49 | 22.0 | 15.4 | ...... | 15.8 | 5.0 | 13.4 | 12.2 | 16.5 | 4.7 | Do. |
| Do | 137424 | ...do | 175 | 46 | 23.0 | 18.4 | 28.0 | 16.7 | 5.2 | 13.3 | 12.6 | 15.9 | 4.6 | Do. |
| Do | 137426 | ...do | 167 | 46 | 23.5 | 16.3 | 27.9 | 16.0 | 5.0 | 13.0 | 11.8 | 16.8 | 4.7 | Do. |
| Santa Fe | 127427 | ...do | ...... | 46 | 21.0 | 15.4 | 26.4 | 15.6 | 4.7 | 13.1 | 11.3 | 15.6 | 4.4 | Much worn. |
| Albiquin | 134640 | Male | 166 | 54 | 23.5 | 16.3 | 27.6 | 15.9 | 5.1 | 13.4 | 11.8 | 16.5 | 4.5 | Moderately worn. |
| Acoma | 148309 | ...do | 150 | 43 | 24.0 | 15.4 | 26.9 | 16.1 | 5.1 | 13.9 | 10.9 | 16.0 | 4.4 | Much worn. |
| Laguna | 148308 | ...do | 160 | 44 | 21.0 | 15.8 | 27.0 | 15.4 | 5.1 | 13.2 | 11.3 | 15.8 | 4.7 | Moderately worn. |
| *O. l. fuliginosus.* | | | | | | | | | | | | | | |
| Arizona: | | | | | | | | | | | | | | |
| Black Tank | [1] [illegible] | Female | 160 | 47 | 21.5 | 15.0 | 25.9 | 15.8 | 5.2 | 13.2 | 11.6 | 15.4 | 4.5 | Much worn. |
| Do | [illegible] | ...do | 160 | 53 | 22.5 | 14.8 | 25.9 | 14.6 | 4.9 | 12.5 | 11.5 | 14.7 | 4.7 | Moderately worn. |

[1] Type.

[2] Type of "*pallescens*."

*Measurements of fully adult specimens of the Onychomys leucogaster group*—Continued.

| Locality. | Number. | Sex. | Total length. | Tail vertebræ. | Hind foot. | Ear from notch. | Skull: Condylobasal length. | Zygomatic breadth. | Interorbital breadth. | Breadth of brain case. | Length of nasals. | Length of mandible. | Maxillary tooth row. | Condition of molar teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *O. l. ruidosæ.* | | | | | | | | | | | | | | |
| New Mexico: | | | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | |
| Las Vegas | 64599 | Female | 163 | 46 | 22.0 | 16.2 | 26.2 | 14.0 | 4.4 | 12.2 | 11.7 | 15.4 | 4.4 | Moderately worn. |
| Capitan | 127387 | ...do | 159 | 51 | 22.0 | 15.9 | 25.7 | 15.6 | 4.7 | 13.2 | 11.1 | 15.8 | 4.3 | Do. |
| Carrizozo | 119149 | ...do | 150 | 47 | 21.0 | 16.0 | 25.9 | 15.1 | 4.8 | 12.7 | 11.3 | 14.8 | 4.3 | Do. |
| Manzano Mountains | 131684 | Male | 158 | 50 | 22.0 | 14.2 | 26.4 | 14.6 | 4.8 | 12.7 | 11.5 | 14.9 | 4.4 | Do. |
| Do | 131688 | ...do | 151 | 53 | 21.0 | 14.4 | 24.9 | 14.0 | 4.7 | 12.2 | 10.8 | 14.3 | 4.4 | Do. |
| Do | 131686 | Female | 153 | 50 | 20.5 | 13.7 | 25.8 | 13.9 | 4.8 | 12.7 | 10.8 | 14.7 | 4.5 | Do. |
| Bear Spring Mountains | 138809 | ...do | 160 | 42 | 23.0 | 15.8 | 25.9 | 14.7 | 4.8 | 13.2 | 11.3 | 15.7 | 4.5 | Do. |
| Do | 138810 | ...do | 167 | 46 | 24.0 | 16.9 | 27.2 | 16.2 | 5.2 | 13.3 | 11.4 | 15.8 | 4.6 | Much worn. |
| San Augustine Plain | 167133 | Male | 164 | 47 | 24.0 | 14.8 | 27.5 | 15.8 | 5.0 | 13.0 | 11.4 | 16.2 | 4.6 | Do. |
| Deming | 157846 | ...do | 155 | 50 | 22.5 | 15.4 | 25.5 | ...... | 4.7 | ...... | 11.2 | 14.4 | 4.4 | Do. |
| Do | [illegible] | Female | 167 | 52 | 23.0 | 15.7 | 26.8 | 15.4 | 5.0 | 12.8 | 11.8 | 16.1 | 4.6 | Do. |
| Do | [illegible] | ...do | 163 | 51 | 22.0 | 15.7 | 26.3 | 14.6 | 4.8 | 12.5 | 11.1 | 15.4 | 4.4 | Moderately worn. |
| Do | 25496 | ...do | ...... | ...... | ...... | ...... | 26.0 | 14.3 | 4.8 | 12.7 | 10.3 | 14.8 | 4.4 | Do. |
| Monument 15 | [illegible] | Male | 161 | 55 | 23.0 | 16.7 | 26.3 | 15.0 | 4.6 | 12.9 | 11.2 | 15.2 | 4.4 | Much worn. |
| Do | [illegible] | Female | ...... | ...... | ...... | 15.9 | 25.3 | 14.2 | 5.0 | 12.7 | 10.8 | 14.5 | 4.3 | Do. |
| Do | [illegible] | ...do | 150 | 47 | 21.0 | 15.8 | 26.2 | 14.6 | 4.7 | 12.7 | 11.5 | 14.8 | 4.6 | Do. |
| Do | [illegible] | ...do | 157 | 50 | 22.0 | 15.8 | 25.6 | 15.2 | 4.7 | 12.7 | 11.2 | 14.8 | 4.4 | Do. |
| Arizona: | | | | | | | | | | | | | | |
| Camp Verde | [illegible] | Male | 167 | 52 | 22.0 | 14.5 | 27.1 | 15.3 | 5.0 | 12.9 | 11.4 | 15.9 | 4.3 | Moderately worn. |
| Do | [illegible] | Female | 153 | 45 | 22.0 | 16.1 | 26.3 | 14.5 | 5.0 | 12.8 | 11.4 | 15.4 | 4.5 | Much worn. |
| San Pedro River | [illegible] | Male | ...... | ...... | ...... | 16.2 | 26.0 | 14.6 | 4.9 | 12.6 | 11.1 | 15.2 | 4.5 | Moderately worn. |
| Do | [illegible] | ...do | 161 | 48 | 22.0 | 15.5 | 26.4 | 14.8 | 4.8 | 12.6 | 11.6 | 15.2 | 4.4 | Much worn. |
| *O. l. capitulatus.* | | | | | | | | | | | | | | |
| Arizona: | | | | | | | | | | | | | | |
| Grand Canyon | 202612 | Male | 142 | 43 | 21.0 | 14.6 | 25.1 | 14.0 | 4.7 | 13.0 | 10.9 | 14.5 | 4.3 | Moderately worn. |
| Do | 202615 | ...do | 146 | 42 | 22.0 | 14.6 | 25.5 | 14.0 | 4.8 | 12.5 | 10.7 | 14.6 | 4.3 | Do. |
| Do | 202618 | ...do | 140 | 43 | 22.0 | 14.5 | 24.6 | 13.8 | 4.8 | 13.0 | 10.8 | 14.3 | 4.3 | Do. |
| Do | 202613 | Female | 153 | 46 | 21.5 | 14.8 | 25.8 | 13.9 | 4.6 | 12.8 | 10.4 | 14.7 | 4.3 | Much worn. |
| Do | 202620 | ...do | 144 | 46 | 22.0 | 15.4 | 25.3 | 14.1 | 4.6 | 12.2 | 10.9 | 14.2 | 4.2 | Moderately worn. |
| Do | 202622 | ...do | 155 | 48 | 21.5 | 15.3 | 25.2 | 13.9 | 4.8 | 12.3 | 11.3 | 14.6 | 4.3 | Much worn. |
| Do | 202624 | ...do | 143 | 44 | 22.0 | 15.1 | 24.3 | 13.7 | 4.6 | 12.2 | 11.0 | 14.3 | 4.3 | Moderately worn. |
| Aubrey Valley | 202626 | Male | 148 | 44 | 22.5 | 14.8 | 25.2 | 14.0 | 4.9 | 12.8 | 10.7 | 14.6 | 4.2 | Do. |
| Do | 202629 | Female | 149 | 48 | 22.5 | 14.4 | 25.2 | 14.2 | 4.8 | 12.9 | 11.8 | 14.6 | 4.5 | Do. |
| Do | 202630 | ...do | 152 | 45 | 22.0 | 14.7 | 25.7 | 14.1 | 4.8 | 12.4 | 11.4 | 14.9 | 4.4 | Do. |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *O. l. albescens.* | | | | | | | | | | | | | | |
| Chihuahua: Samalayuca | [1] 50040 | Female | 160 | 60 | 23.0 | 15.6 | 26.0 | 14.2 | 4.8 | 12.9 | 11.6 | 15.0 | 4.3 | Moderately worn. |
| *O. l. longipes.* | | | | | | | | | | | | | | |
| Texas: | | | | | | | | | | | | | | |
| Concho County | [2] 186478 | Female | 190 | 48 | 25.0 | 15.0 | 27.0 | 15.2 | 4.6 | 12.5 | 11.8 | 16.2 | 4.2 | Moderately worn. |
| Comstock | [illegible] | Male | 152 | 52 | 22.0 | 15.9 | 25.9 | 14.3 | 4.6 | 11.9 | 10.9 | 15.1 | 4.1 | Do. |
| Do | [illegible] | Female | 157 | 50 | 22.0 | 15.9 | 26.2 | 15.2 | 4.6 | 12.2 | 11.9 | 15.3 | 4.3 | Much worn. |
| Do | [illegible] | ...do | 165 | 55 | 23.0 | 15.9 | 26.5 | 14.6 | 4.8 | 13.2 | 11.6 | 15.7 | 4.5 | Do. |
| Eagle Pass | [illegible] | Male | 164 | 55 | 23.0 | 16.8 | 27.5 | 15.4 | 4.5 | 12.9 | 11.8 | 15.9 | 4.4 | Moderately worn. |
| Do | [illegible] | ...do | 155 | 56 | 23.0 | 16.8 | 26.8 | ...... | 4.6 | 12.3 | 11.7 | 15.7 | 4.5 | Do. |
| Fort Clark | [illegible] | ...do | 167 | 55 | 23.0 | 15.5 | 27.1 | 15.3 | 4.7 | 13.1 | 11.2 | 15.8 | 4.3 | Much worn. |
| Laredo | [illegible] | ...do | 165 | 60 | 22.0 | 16.3 | ...... | 15.2 | 4.9 | 13.0 | 11.8 | 16.2 | 4.6 | Moderately worn. |
| Do | [illegible] | Female | 169 | 55 | 23.0 | 16.5 | 28.9 | 15.5 | 4.8 | 12.4 | 12.7 | 16.1 | 4.8 | Much worn. |
| Lomita Ranch | [illegible] | Male | 180 | 55 | 23.0 | 15.7 | 26.9 | 14.5 | 4.6 | 12.8 | 11.3 | 16.1 | 4.4 | Do. |
| San Angelo | 108357 | Female | 182 | 61 | 23.0 | 16.2 | 28.2 | 15.3 | 4.9 | 13.3 | 12.5 | 17.1 | 4.6 | Moderately worn. |
| Tamaulipas: Reynosa | 58679 | ...do | ...... | ...... | ...... | 16.9 | 27.2 | 15.5 | 5.2 | 13.2 | 12.2 | 16.0 | 4.6 | Do. |
| *O. l. breviauritus.* | | | | | | | | | | | | | | |
| Kansas: Kinsley | 134525 | Male | 152 | 43 | 23.0 | 12.8 | 28.2 | 15.9 | 4.6 | 13.1 | 11.8 | 16.1 | 4.6 | Moderately worn. |
| Oklahoma: | | | | | | | | | | | | | | |
| Alva | 96057 | ...do | ...... | ...... | ...... | 12.6 | ...... | 15.2 | 4.8 | ...... | 11.5 | 14.8 | 4.7 | Moderately worn. |
| Do | [3] 8522 | ...do | ...... | ...... | ...... | 12.2 | 27.5 | 15.4 | 5.0 | 13.1 | 11.8 | 16.2 | 4.5 | Much worn. |
| Do | [3] 8523 | ...do | ...... | ...... | ...... | 12.7 | 26.0 | 15.2 | 4.8 | 13.0 | 11.2 | 15.7 | 4.6 | Moderately worn. |
| Do | [3] 8521 | Female | 151 | 38 | 22.0 | 13.1 | 26.4 | 15.0 | 4.7 | 12.9 | 11.6 | 15.5 | 4.6 | Do. |
| Do | [4] 6720 | ...do | 155 | 44 | 22.0 | 12.8 | 26.0 | 14.9 | 4.6 | 12.5 | 11.5 | 15.7 | 4.7 | Do. |
| Fort Reno | [1] [illegible] | ...do | 164 | 42 | 21.0 | 13.2 | 27.4 | 15.1 | 4.4 | 12.5 | 11.5 | 15.9 | 4.7 | Do. |

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[1] Type.

[2] Type; collector's field measurements probably too large, especially the measurement of hind foot.

[3] Museum Comparative Zoology at Harvard.

[4] Field Museum, Chicago.

*Measurements of fully adult specimens of the Onychomys torridus group.*

| Locality. | Number. | Sex. | Total length. | Tail vertebræ. | Hind foot. | Ear from notch. | Skull: Condylobasal length. | Zygomatic breadth. | Interorbital breadth. | Breadth of brain case. | Length of nasals. | Length of mandible. | Maxillary tooth row. | Condition of molar teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *O. t. torridus.* | | | | | | | | | | | | | | |
| Arizona: | | | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | |
| Dos Cabesos | [illegible] | Male | 146 | 50 | 21.5 | 14.5 | 23.7 | 12.7 | 4.5 | 11.8 | 10.0 | 13.5 | 3.8 | Much worn. |
| Do | [illegible] | Female | 151 | 54 | 21.0 | 14.5 | 23.6 | 12.9 | 4.7 | 11.8 | 10.3 | 13.7 | 3.7 | Moderately worn. |
| San Pedro River | [illegible] | ...do | 151 | 57 | 21.0 | 14.0 | 23.7 | 13.3 | 4.6 | 11.6 | 10.2 | 14.1 | 3.7 | Much worn. |
| Santa Cruz River | [illegible] | ...do | 146 | 55 | 21.0 | 14.4 | 23.8 | 13.3 | 4.5 | 11.8 | 9.3 | 13.8 | 3.8 | Do. |
| Calabasas | [illegible] | ...do | 153 | 56 | 20.0 | 15.8 | 24.0 | 13.7 | 4.5 | 11.7 | 10.3 | 13.9 | 3.9 | Moderately worn. |
| New Mexico: | | | | | | | | | | | | | | |
| Tularosa | 119158 | ...do | 150 | 52 | 21.0 | 14.6 | 23.6 | 12.7 | 4.5 | 11.9 | 9.8 | 13.7 | 3.7 | Much worn. |
| Do | 119787 | ...do | 148 | 54 | 22.0 | 14.5 | 23.9 | 12.9 | 4.8 | 11.6 | 9.9 | 13.7 | 3.8 | Moderately worn. |
| Carrizalilio Springs | [illegible] | ...do | 147 | 57 | 22.0 | 13.5 | 23.2 | 12.6 | 4.8 | 11.3 | 10.3 | 13.3 | 3.6 | Much worn. |
| Corner monument | [illegible] | Male | 139 | 49 | 21.0 | 12.5 | 22.6 | 12.4 | 4.5 | 11.6 | 9.3 | 13.2 | 3.5 | Do. |
| Do | [illegible] | ...do | 134 | 47 | 20.0 | 14.0 | 22.4 | 12.2 | 4.4 | 11.6 | 9.2 | 13.3 | 3.6 | Do. |
| Do | [illegible] | ...do | 139 | 47 | 21.0 | 13.0 | 22.4 | 12.7 | 4.6 | 11.2 | 9.3 | 13.1 | 3.9 | Do. |
| Do | [illegible] | ...do | 139 | 50 | 21.0 | 12.0 | 22.5 | 11.9 | 4.3 | 11.2 | 9.4 | 13.1 | 3.6 | Moderately worn. |
| Do | [illegible] | Female | 139 | 50 | 21.0 | 14.2 | 22.9 | 13.1 | 4.5 | 11.9 | 9.4 | 13.7 | 3.7 | Much worn. |
| Do | [illegible] | ...do | 137 | 47 | 22.0 | 13.7 | 23.1 | 12.5 | 4.5 | 11.9 | 9.8 | 13.3 | 3.8 | Moderately worn. |
| Do | [illegible] | ...do | 152 | 53 | 20.5 | 14.3 | 23.3 | 12.7 | 4.4 | 11.6 | 9.8 | 13.6 | 3.8 | Much worn. |
| Do | [illegible] | ...do | 138 | 56 | 22.0 | 14.5 | 22.4 | 12.0 | 4.3 | 11.6 | 9.1 | 13.2 | 3.8 | Do. |
| Pleasanton | 158327 | ...do | 151 | 54 | 21.5 | 15.2 | 23.4 | 12.0 | 4.4 | 11.4 | 9.6 | 12.8 | 3.5 | Do. |
| Socorro | 160715 | Male | 158 | 60 | 21.5 | 14.8 | 24.4 | 13.4 | 4.8 | 11.9 | 9.5 | 14.0 | 3.9 | Do. |
| Do | 160713 | Female | 151 | 51 | 21.0 | 15.2 | 23.5 | 12.0 | 4.5 | 11.6 | 9.7 | 13.4 | 3.8 | Do. |
| Glenwood | 148310 | Male | 143 | 51 | 22.0 | 14.8 | 23.3 | 12.6 | 4.5 | 11.7 | 10.0 | 13.4 | 3.9 | Do. |
| Sonora: Magdalena | [illegible] | Female | 150 | 55 | 21.0 | 13.7 | 24.0 | 13.2 | 4.3 | 11.6 | 10.4 | 13.9 | 3.8 | Moderately worn. |
| Chihuahua: | | | | | | | | | | | | | | |
| Gallego | 57625 | ...do | 148 | 50 | 21.0 | 14.9 | 22.8 | 12.2 | 4.5 | 11.0 | 8.9 | 13.0 | 3.5 | Do. |
| Casas Grandes | 97419 | Male | 149 | 55 | 22.0 | 12.4 | 22.6 | 12.8 | 4.5 | 11.7 | 9.2 | 13.2 | 3.6 | Do. |
| Do | 97423 | ...do | 149 | 53 | 21.5 | 12.7 | 22.9 | 12.5 | ...... | 11.0 | ...... | 13.3 | 3.7 | Much worn. |
| Do | 97421 | Female | 138 | 51 | 21.5 | 13.0 | 22.3 | 12.3 | 4.5 | 11.0 | 9.4 | 12.6 | 3.6 | Moderately worn. |
| Durango: Inde | 95279 | Male | 145 | 52 | 21.0 | 15.2 | 23.3 | ...... | 4.2 | 11.4 | 9.5 | 13.5 | 3.9 | Much worn. |
| Texas: | | | | | | | | | | | | | | |
| Fort Lancaster | 108361 | Female | 163 | 57 | 20.0 | 15.2 | 23.9 | 12.9 | 4.6 | 11.6 | 10.3 | 13.7 | 4.2 | Do. |
| Do | 108363 | ...do | 136 | 48 | 20.0 | 14.8 | 23.1 | 12.3 | 4.6 | 11.8 | 10.1 | 13.3 | 3.8 | Moderately worn. |
| Marathon | 108575 | ...do | 160 | 57 | 21.0 | 14.8 | 23.4 | 12.5 | 4.4 | 11.9 | 10.2 | 13.7 | 4.0 | Much worn. |
| Marfa | [illegible] | Male | 140 | 53 | 20.0 | 13.6 | 22.7 | 12.0 | 4.5 | 11.6 | 9.7 | 12.8 | 3.7 | Moderately worn. |
| Do | [illegible] | ...do | 137 | 54 | 21.0 | 14.4 | 22.6 | 12.6 | 4.7 | 12.0 | 9.9 | 13.1 | 3.9 | Do. |
| Do | [illegible] | Female | 140 | 51 | 20.5 | 15.3 | 22.2 | 12.4 | 4.1 | 11.1 | 9.8 | 12.8 | 3.6 | Do. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sierra Blanca | [illegible] | Male | 156 | 60 | 21.5 | 15.2 | 23.4 | 12.8 | 4.5 | 11.1 | 10.3 | 13.2 | 3.7 | Do. |
| Do | [illegible] | do | 141 | 55 | 21.0 | 14.0 | 23.4 | 12.8 | 4.5 | 11.5 | 10.4 | 13.5 | 4.0 | Do. |
| Do | [illegible] | do | 143 | 51 | 20.5 | 14.4 | 22.8 | ...... | 4.6 | 11.3 | 9.5 | 12.8 | 3.7 | Do. |
| Do | [illegible] | Female | 142 | 54 | 20.0 | 13.9 | 22.8 | 12.3 | 4.5 | 11.7 | 10.0 | 13.6 | 3.4 | Do. |
| Do | [illegible] | do | 149 | 57 | 20.5 | 13.3 | 22.9 | 12.6 | 4.6 | 11.7 | 9.7 | 13.3 | 3.8 | Do. |
| Do | [illegible] | do | 157 | 55 | 20.0 | 12.8 | 23.9 | 12.3 | 4.5 | 11.1 | 10.4 | 13.0 | 3.7 | Much worn. |
| Do | [illegible] | do | 154 | 57 | 21.5 | 13.9 | 23.7 | 12.6 | 4.5 | 11.4 | 10.0 | 13.6 | 3.7 | Moderately worn. |
| El Paso | [illegible] | do | 146 | 53 | 21.0 | 14.5 | 24.0 | 11.6 | 4.7 | 11.5 | 10.1 | 13.9 | 4.0 | Much worn. |
| Do | [1] [illegible] | Male | 137 | 53 | 21.0 | 14.0 | 23.5 | 13.1 | 4.5 | 11.8 | 9.8 | 14.0 | 3.8 | Do. |
| *O. t. perpallidus.* | | | | | | | | | | | | | | |
| Arizona: | | | | | | | | | | | | | | |
| Yuma County | [2] 60174 | Female | 157 | 57 | 22.0 | 15.8 | 23.7 | 13.1 | 4.4 | 11.5 | 9.4 | 13.9 | 3.8 | Moderately worn. |
| Do | 189288 | Male | ...... | ...... | ...... | 15.9 | 23.8 | 12.7 | 4.5 | 11.3 | 9.5 | 13.5 | 3.7 | Do. |
| Phoenix | [illegible] | Female | 161 | 58 | 21.0 | 16.3 | 25.3 | 13.2 | 4.7 | 11.5 | 10.5 | 14.2 | 4.0 | Much worn. |
| Beales Spring | 129774 | Male | 146 | 57 | 20.0 | 14.9 | 23.5 | 13.0 | 4.7 | 11.3 | 10.2 | 13.6 | 3.7 | Do. |
| *O. t. pulcher.* | | | | | | | | | | | | | | |
| California: | | | | | | | | | | | | | | |
| Victorville | 151640 | Male | 136 | 49 | 19.0 | 14.3 | 22.0 | 12.6 | 4.7 | 11.5 | 8.8 | 12.6 | 3.6 | Much worn. |
| Morongo Pass | 151282 | do | 120 | 44 | 18.0 | 12.7 | 22.2 | 12.6 | 4.6 | 11.4 | 8.9 | 12.8 | 3.6 | Moderately worn. |
| Do | 151281 | .......... | 128 | 37 | 18.0 | 14.5 | 22.4 | 12.6 | 4.7 | 11.5 | 9.3 | 12.7 | 3.5 | Do. |
| Needles | 137096 | Male | 144 | 51 | 20.0 | 15.4 | 23.5 | 13.2 | 5.1 | 11.8 | 9.5 | 13.7 | 3.6 | Much worn. |
| Do | 137095 | Female | 137 | 50 | 20.0 | 15.5 | 22.6 | 12.7 | 4.8 | 11.7 | 9.9 | 13.3 | 3.6 | Moderately worn. |
| Whitewater | 54070 | Male | 134 | 47 | 20.0 | 15.1 | 23.4 | 13.1 | 4.8 | 11.9 | 9.3 | 13.4 | 3.9 | Much worn. |
| Cabezon | 54064 | Female | 142 | 46 | 20.0 | 14.5 | 23.3 | 12.9 | 4.8 | 11.4 | 8.9 | 13.3 | 3.4 | Moderately worn. |
| Do | 54065 | do | 139 | 49 | 20.0 | 14.6 | 23.3 | 12.7 | 4.4 | 11.7 | 9.2 | 13.3 | 3.3 | Much worn. |
| Do | 54066 | do | 145 | 50 | 19.0 | 14.2 | 23.2 | 12.7 | 4.8 | 11.2 | 9.7 | 13.4 | 3.6 | Moderately worn. |
| *O. t. longicaudus.* | | | | | | | | | | | | | | |
| Utah: | | | | | | | | | | | | | | |
| St. George | [2] 186476 | Male | 145 | 55 | 20.0 | 14.1 | 23.2 | 12.8 | 4.8 | 11.8 | 9.9 | 13.6 | 3.8 | Moderately worn. |
| Do | 189281 | do | 148 | 46 | 20.0 | 14.2 | 23.3 | 12.9 | 4.9 | 11.5 | 9.4 | 13.6 | 3.7 | Do. |
| Do | 189280 | Female | 140 | 50 | 19.0 | 14.1 | 22.5 | 12.7 | 4.8 | 11.6 | 9.7 | 13.3 | 3.8 | Do. |
| Nevada: | | | | | | | | | | | | | | |
| Pahroc Spring | [illegible] | Male | 136 | 47 | 20.0 | 14.5 | 22.6 | 12.8 | 5.0 | 11.7 | 8.9 | 12.8 | 3.6 | Much worn. |
| St. Thomas | 189285 | do | 144 | 44 | 20.0 | 14.5 | 22.9 | 12.7 | 4.6 | 11.7 | 9.3 | 12.5 | 3.7 | Moderately worn. |
| Colorado River | [illegible] | do | 145 | 53 | 20.0 | 13.7 | 22.9 | 13.3 | 5.0 | 11.7 | 9.5 | 13.3 | 3.5 | Much worn. |
| Charleston Mountains | [illegible] | Female | 146 | 55 | 20.0 | 14.8 | 23.4 | 12.8 | 4.9 | 11.4 | 9.4 | 13.2 | 3.7 | Moderately worn. |
| Do | [illegible] | do | 149 | 54 | 21.0 | 13.3 | 23.8 | 13.3 | 5.0 | 12.2 | 9.7 | 14.2 | 3.7 | Much worn. |
| Pahrump Valley | [illegible] | Male | 139 | 47 | 19.5 | 13.2 | 22.7 | 12.7 | 4.9 | 11.9 | 9.2 | 13.5 | 3.4 | Moderately worn. |
| Do | [illegible] | do | 138 | 51 | 20.0 | 13.8 | 22.4 | 12.8 | 5.0 | 11.6 | 9.0 | 13.0 | 3.6 | Do. |
| Do | [illegible] | do | 145 | 49 | 20.0 | 15.6 | 23.5 | 13.1 | 5.0 | 11.4 | 9.0 | 13.4 | 3.7 | Much worn. |
| Do | [illegible] | Female | 131 | 49 | 19.5 | 14.4 | 21.9 | ...... | 4.8 | 11.1 | 8.9 | 12.9 | 3.5 | Moderately worn. |
| Do | [illegible] | do | 145 | 54 | 20.0 | 14.5 | 22.5 | 12.7 | 4.9 | 11.5 | 9.0 | 13.2 | 3.6 | Do. |
| Do | [illegible] | do | 138 | 45 | 20.0 | 15.4 | 22.8 | 12.7 | 4.8 | 11.2 | 8.8 | 13.0 | 3.5 | Much worn. |
| Oasis Valley | [illegible] | Male | 138 | 52 | 21.0 | 14.2 | ...... | 12.7 | 4.9 | 11.6 | 9.1 | 13.3 | 3.4 | Do. |
| Carson Sink | 156860 | Female | 140 | 48 | 20.0 | 14.3 | 23.4 | 13.3 | 4.9 | 11.8 | 9.8 | 13.5 | 3.7 | Do. |
| Do | 156862 | do | 130 | 40 | 19.5 | 14.8 | 21.8 | 12.7 | 4.5 | 11.3 | 8.8 | 12.9 | 3.5 | Moderately worn. |

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[1] Type of *Onychomys torridus arenicola* Mearns.

[2] Type.

*Measurements of fully adult specimens of the Onychomys torridus group*—Continued.

| Locality. | Number. | Sex. | Total length. | Tail vertebrae. | Hind foot. | Ear from notch. | Skull: Condylobasal length. | Zygomatic breadth. | Interorbital breadth. | Breadth of braincase. | Length of nasals. | Length of mandible. | Maxillary tooth row. | Condition of molar teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *O. t. longicaudus*—Continued. | | | | | | | | | | | | | | |
| California: | | | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | *mm.* | |
| Amargosa | [illegible] | Female | 155 | 58 | 20.0 | 14.2 | 23.3 | 13.2 | 4.8 | 11.5 | 9.6 | 13.9 | 3.8 | Much worn. |
| Resting Springs | [illegible] | Male | 133 | 47 | 19.0 | 14.2 | 22.9 | 12.5 | 4.9 | 11.4 | 9.4 | 13.2 | 3.7 | Moderately worn. |
| Do | [illegible] | ...do | 139 | 53 | 19.5 | 14.7 | 22.8 | 13.0 | 4.9 | 11.5 | 9.3 | 13.3 | 3.7 | Do. |
| Panamint Mountains | [illegible] | ...do | 141 | 53 | 20.0 | 13.7 | 22.4 | 12.8 | 4.6 | 11.4 | 9.4 | 12.8 | 3.5 | Much worn. |
| Do | [illegible] | Female | 147 | 51 | 19.0 | 13.8 | 22.8 | 13.2 | 4.9 | 11.9 | 8.9 | 13.0 | 3.5 | Do. |
| Maturango Springs | [illegible] | Male | 135 | 49 | 20.0 | 13.8 | 22.3 | 12.8 | 4.8 | 11.5 | 8.6 | 13.2 | 3.6 | Moderately worn. |
| *O. t. clarus.* | | | | | | | | | | | | | | |
| California: | | | | | | | | | | | | | | |
| Lone Pine | [illegible] | Female | ...... | ...... | ...... | 14.4 | 22.2 | 13.3 | 4.8 | 12.1 | 9.4 | 13.3 | 3.6 | Much worn. |
| Do | [illegible] | Male | 144 | 53 | 20.0 | 14.2 | 23.2 | 12.8 | 4.9 | 11.7 | 9.4 | 13.6 | 3.7 | Moderately worn. |
| Keeler | [1] [illegible] | ...do | 143 | 51 | 20.5 | 15.7 | 23.3 | 13.2 | 4.9 | 11.6 | 9.5 | 13.2 | 3.7 | Much worn. |
| Olanche | [illegible] | Female | 140 | 53 | 20.0 | 14.8 | 23.2 | 12.8 | 4.7 | 11.9 | 9.6 | 13.3 | 3.7 | Do. |
| Hot Springs Valley | [illegible] | Male | 133 | 49 | 18.0 | 14.3 | 22.1 | 12.2 | 4.8 | 11.5 | 8.7 | 12.9 | 3.5 | Do. |
| Do | [illegible] | Female | 146 | 51 | 20.0 | 15.5 | 23.3 | 12.2 | 4.8 | 11.6 | 8.9 | 13.4 | 3.4 | Do. |
| *O. t. tularensis.* | | | | | | | | | | | | | | |
| California: | | | | | | | | | | | | | | |
| Bakersfield | [1] [illegible] | Female | 148 | 52 | 20.0 | 15.1 | 23.2 | 12.7 | 4.8 | 11.5 | 9.0 | 13.7 | 3.5 | Moderately worn. |
| Alcalde | 65161 | ...do | 141 | 54 | 22.0 | 14.6 | 23.3 | 12.5 | 4.6 | 11.8 | 8.9 | 13.1 | 3.7 | Do. |
| Huron | 54780 | ...... | ...... | ...... | ...... | ...... | 24.0 | 13.3 | 4.9 | 11.7 | 9.5 | 13.6 | 3.8 | Do. |
| Little Panoche Creek | 151339 | Female | 142 | 51 | 20.5 | 14.0 | 23.3 | 12.9 | 4.5 | 11.8 | 9.8 | 13.2 | 3.6 | Do. |
| *O. t. ramona.* | | | | | | | | | | | | | | |
| California: | | | | | | | | | | | | | | |
| San Fernando | [illegible] | Female | 140 | 36 | 19.0 | 14.4 | 22.6 | 12.8 | 4.6 | 11.5 | 9.5 | 13.8 | 3.4 | Much worn. |
| Reche Canyon | 127979 | Male | 143 | 50 | 21.0 | 14.2 | 23.3 | 12.7 | 4.9 | 12.3 | 9.4 | 13.4 | 3.6 | Do. |
| Do | 127978 | Female | 148 | 56 | 20.0 | 14.6 | 23.6 | 13.7 | 4.8 | 11.7 | 9.8 | 14.0 | 3.6 | Do. |
| Riverside | 94067 | ...do | 137 | 40 | 20.0 | 14.3 | 23.8 | 13.3 | 4.9 | 11.4 | 9.5 | 13.9 | 3.4 | Do. |
| Jacumba | 126069 | ...do | 140 | 54 | 20.0 | 14.5 | 23.3 | 13.0 | 5.0 | 12.1 | 9.2 | 13.2 | 3.6 | Do. |
| Tia Juana River | 126061 | Male | 137 | 49 | 21.0 | 15.1 | 23.5 | 13.1 | 4.7 | 11.6 | 9.7 | 13.8 | 3.5 | Do. |
| Do | 126062 | ...do | 138 | 50 | 20.0 | 14.8 | 23.4 | 13.2 | 4.6 | 11.6 | 9.7 | 13.7 | 3.5 | Do. |
| Do | 126065 | Female | 140 | 52 | 21.0 | 15.4 | 23.5 | 13.2 | 4.9 | 11.7 | 9.7 | 13.2 | 3.6 | Moderately worn. |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lower California:** | | | | | | | | | | | | | | |
| Tecarte Valley | 126066 | Male | 141 | 55 | 20.0 | 14.2 | 23.8 | 13.2 | 4.8 | 11.9 | 10.1 | 13.8 | 3.7 | Much worn. |
| Do | 126068 | Female | 145 | 54 | 21.0 | 15.4 | 23.4 | 13.4 | 4.8 | 11.8 | 10.1 | 13.5 | 3.7 | Do. |
| *O. t. macrotis.* | | | | | | | | | | | | | | |
| **Lower California:** | | | | | | | | | | | | | | |
| San Antonio River | [2] 10283 | Female | 155 | 55 | 21.0 | 16.7 | 24.3 | 13.3 | 4.9 | 11.7 | 10.3 | 14.1 | 3.7 | Much worn. |
| San Quentin | 138946 | ...do... | 148 | 54 | 22.0 | 16.8 | 24.7 | 13.5 | 5.0 | 11.8 | 10.1 | 14.2 | 3.7 | Do. |
| *O. t. yakiensis.* | | | | | | | | | | | | | | |
| **Sonora:** | | | | | | | | | | | | | | |
| Camoa | 95857 | Male | 152 | 56 | 24.0 | 15.8 | 24.2 | 13.4 | 4.5 | 11.7 | 10.1 | 14.2 | 4.0 | Moderately worn. |
| Do | [1] 95855 | Female | 154 | 53 | 22.0 | 17.8 | 25.4 | 13.5 | 4.6 | 12.0 | 10.6 | 15.1 | 3.9 | Do. |
| Do | 95860 | ...do... | 144 | 47 | 22.5 | 15.5 | 23.7 | 13.4 | 4.4 | 12.2 | 10.0 | 13.8 | 3.8 | Do. |
| Do | 96390 | ...do... | 138 | 49 | 22.5 | 15.6 | 22.4 | 12.4 | 4.3 | 11.4 | 9.1 | 12.8 | 3.9 | Do. |
| Do | 96391 | ...do... | 152 | 54 | 21.5 | 15.2 | 23.9 | 13.3 | 4.4 | 12.1 | 9.8 | 14.1 | 3.8 | Do. |
| Alamos | 96386 | Male | 149 | 57 | 22.5 | 16.3 | 23.9 | 13.2 | 4.3 | 11.9 | 10.1 | 13.9 | 4.0 | Do. |
| Do | 96384 | Female | 156 | 55 | 21.5 | 15.8 | 24.2 | 13.2 | 4.5 | 11.6 | 9.9 | 14.4 | 3.8 | Do. |
| *O. t. canus.* | | | | | | | | | | | | | | |
| **Zacatecas:** | | | | | | | | | | | | | | |
| San Juan Capistrano | 90840 | Female | 147 | 51 | 22.0 | 15.3 | 23.7 | 12.7 | 4.4 | 11.7 | 9.8 | 13.8 | 3.7 | Much worn. |
| Do | 90841 | ...do... | 151 | 55 | 21.0 | 16.3 | 23.5 | 12.6 | 4.7 | 11.6 | 10.3 | 13.7 | 3.8 | Moderately worn. |
| Do | 90842 | ...do... | 148 | 56 | 23.0 | 15.7 | 23.6 | 12.4 | 4.4 | 11.7 | 10.1 | 13.5 | 3.6 | Much worn. |
| Do | [1] 90843 | ...do... | 152 | 55 | 22.0 | 15.2 | 23.8 | 13.1 | 4.6 | 11.7 | 10.1 | 13.9 | 3.9 | Moderately worn. |
| **San Luis Potosi:** | | | | | | | | | | | | | | |
| Jesus Maria | 50705 | Male | 146 | 42 | 21.0 | 17.1 | 24.9 | 13.2 | 4.8 | 11.8 | 10.3 | 13.9 | 3.8 | Much worn. |
| Rio Verde | 82102 | Female | 153 | 58 | 22.5 | 16.4 | 24.4 | 12.7 | 4.4 | 12.0 | 10.7 | 14.1 | 3.6 | Moderately worn. |
| *O. t. surrufus.* | | | | | | | | | | | | | | |
| **Tamaulipas:** | | | | | | | | | | | | | | |
| Jaumave | 93828 | Male | 152 | 55 | 22.0 | ...... | 24.2 | 13.3 | 4.8 | 12.0 | 10.5 | 13.8 | 3.8 | Moderately worn. |
| Do | 93831 | ...do... | 154 | 58 | 23.0 | 16.8 | 24.9 | 13.2 | 4.7 | 11.8 | 10.1 | 13.8 | 3.8 | Do. |
| Do | 93832 | ...do... | 150 | 58 | 22.0 | 16.7 | 23.7 | 13.3 | 4.7 | 11.9 | 10.3 | 13.7 | 3.8 | Do. |
| Miquihuana | 93833 | ...do... | 156 | 64 | 22.0 | 16.8 | 24.3 | 12.9 | 4.9 | 12.1 | 10.4 | 13.9 | 4.1 | Do. |
| Do | 93835 | ...do... | 148 | 58 | 22.0 | 16.0 | 24.3 | 13.2 | 4.5 | 12.2 | 9.9 | 13.9 | 3.8 | Much worn. |
| Do | 93836 | ...do... | 153 | 58 | 22.0 | 16.8 | 24.0 | 12.8 | 4.4 | 11.5 | 9.6 | 13.8 | 3.8 | Do. |
| Do | 93837 | ...do... | 153 | 56 | 22.0 | 16.7 | 24.0 | 13.1 | 4.6 | 11.9 | 10.2 | 14.1 | 3.8 | Do. |
| Do | 93838 | ...do... | 154 | 62 | 22.5 | 16.8 | 24.3 | 12.7 | 4.5 | 11.7 | 9.8 | 14.2 | 3.9 | Moderately worn. |
| Do | [1] 93839 | Female | 163 | 62 | 22.5 | 16.8 | 25.0 | 13.6 | 4.8 | 11.8 | 10.3 | 14.6 | 3.8 | Much worn. |
| Do | 93840 | ...do... | 163 | 60 | 22.0 | 16.8 | 24.6 | 12.8 | 4.5 | 11.9 | 10.1 | 13.7 | 3.8 | Do. |
| Do | 93843 | ...do... | 158 | 62 | 21.5 | 17.2 | 24.7 | 13.2 | 4.4 | 11.8 | 9.8 | 14.2 | 4.0 | Do. |

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[1] Type.

[2] Type; Field Museum of Natural History, Chicago.

| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|
| 4.6 | [illegible] | [illegible] | [illegible] | [illegible] |
| 4.4 | [illegible] | [illegible] | [illegible] | [illegible] |
| 4.6 | [illegible] | [illegible] | [illegible] | [illegible] |
| 4.0 | 14.6 | [illegible] | [illegible] | [illegible] |
| 4.1 | 14.8 | 10.1 | 12.7 | [illegible] |
| 4.6 | 15.4 | 10.9 | 12.7 | [illegible] |
| 4.5 | 15.4 | 11.5 | 12.9 | [illegible] |
| 4.6 | 15.1 | 11.0 | 12.9 | [illegible] |
| 4.4 | 15.3 | 11.2 | [illegible] | [illegible] |
| 4.3 | 14.5 | 10.9 | 12.6 | [illegible] |
| 4.3 | 15.0 | 11.0 | 12.9 | [illegible] |
| 4.4 | 15.9 | 11.8 | 12.7 | 4.7 |
| 4.6 | 15.7 | 11.6 | 12.9 | 4.7 |

*Average measurements of adult specimens of the subspecies of Onychomys torridus.*

| Number of specimens averaged. | Subspecies. | Localities. | Total length. | Tail vertebræ. | Hind foot. | Ear from notch. | Skull: Condylobasal length. | Zygomatic breadth. | Interorbital breadth. | Breadth of braincase. | Length of nasals. | Length of mandible. | Maxillary tooth row. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | *O. t. torridus* | Arizona, New Mexico, Sonora and Chihuahua. | 146 | 52.1 | 21.2 | 14.0 | 23.3 | 12.7 | 4.5 | 11.5 | 9.7 | 13.4 | 3.7 |
| 17 | do | Texas and southeastern New Mexico. | 147 | 53.6 | 20.7 | 14.3 | 23.4 | 12.5 | 4.5 | 11.6 | 10.0 | 13.4 | 3.8 |
| 4 | *O. t. perpallidus* | Arizona | 155 | 57.3 | 21.0 | 15.7 | 24.1 | 13.0 | 4.6 | 11.4 | 9.9 | 13.8 | 3.8 |
| 9 | *O. t. pulcher* | California | 136 | 48.0 | 19.6 | 14.5 | 22.7 | 12.7 | 4.7 | 11.6 | 9.3 | 13.2 | 3.6 |
| 28 | *O. t. longicaudus* | Utah, Nevada, and California. | 141 | 49.6 | 19.9 | 14.2 | 22.8 | 12.9 | 4.9 | 11.6 | 9.2 | 13.3 | 3.6 |
| 6 | *O. t. clarus* | California | 141 | 51.4 | 19.7 | 14.8 | 23.0 | 12.8 | 4.8 | 11.7 | 9.3 | 13.3 | 3.6 |
| 4 | *O. t. tularensis* | do | 144 | 52.3 | 20.8 | 14.6 | 23.5 | 12.9 | 4.7 | 11.6 | 9.2 | 13.4 | 3.7 |
| 10 | *O. t. ramona* | California and northwestern Lower California. | 141 | 49.5 | 20.3 | 14.7 | 23.4 | 13.2 | 4.8 | 11.8 | 9.7 | 13.6 | 3.6 |
| 2 | *O. t. macrotis* | Lower California | 152 | 55.5 | 21.5 | 16.8 | 24.5 | 13.4 | 5.0 | 11.8 | 10.2 | 14.2 | 3.7 |
| 7 | *O. t. yakiensis* | Sonora | 149 | 53.0 | 22.4 | 16.0 | 24.0 | 13.2 | 4.5 | 11.8 | 9.9 | 14.3 | 3.9 |
| 7 | *O. t. canus* | Zacatecas and San Luis Potosi. | 150 | 52.8 | 21.9 | 16.0 | 24.0 | 12.8 | 4.5 | 11.8 | 10.2 | 13.8 | 3.7 |
| 11 | *O. t. surrufus* | Tamaulipas | 155 | 59.4 | 22.1 | 16.7 | 24.4 | 13.1 | 4.6 | 10.8 | 10.1 | 14.0 | 3.9 |

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## EXPLANATION OF PLATE 15.

Skulls of *Onychomys*, dorsal views, about natural size.

Fig. 1. *Onychomys leucogaster leucogaster*, U.S.N.M (Biological Survey Coll.), Cat. No. 180027, male adult, Hankinson, North Dakota, July 25, 1912, V. Bailey.

2. *Onychomys leucogaster fuscogriseus*, U.S.N.M. (Biological Survey Coll.), Cat. No. 149060, female adult, Baird, Washington, June 6, 1907, S. E. Piper.

3. *Onychomys leucogaster melanophrys*, U.S.N.M. (Biological Survey Coll.), Cat. No. 57201, male adult, Bluff City, Utah, November 8, 1893, J. A. Loring.

4. *Onychomys leucogaster ruidosæ*, U.S.N.M. (Biological Survey Coll.), Cat. No. 127387, female adult, Capitan Mountains, New Mexico, July 2, 1903, J. H. Gaut.

5. *Onychomys leucogaster capitulatus*, U.S.N.M. (Biological Survey Coll.), Cat. No. 202615, male adult, Grand Canyon, Arizona, October 3, 1913, E. A. Goldman.

6. *Onychomys leucogaster longipes*, U.S.N.M. (Biological Survey Coll.), Cat. No. 32232, female adult, Laredo, Texas, December 23, 1890, W. Lloyd.

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10. *Onychomys torridus macrotis*, U.S.N.M. (Biological Survey Coll.), Cat. No. 138946, female adult, San Quentin, Lower California, Mexico, August 4, 1905, E. W. Nelson and E. A. Goldman.

11. *Onychomys torridus yakiensis*, U.S.N.M. (Biological Survey Coll.), Cat. No. 96391, female adult, Camoa, Rio Mayo, Sonora, Mexico, January 17, 1899, E. A. Goldman.

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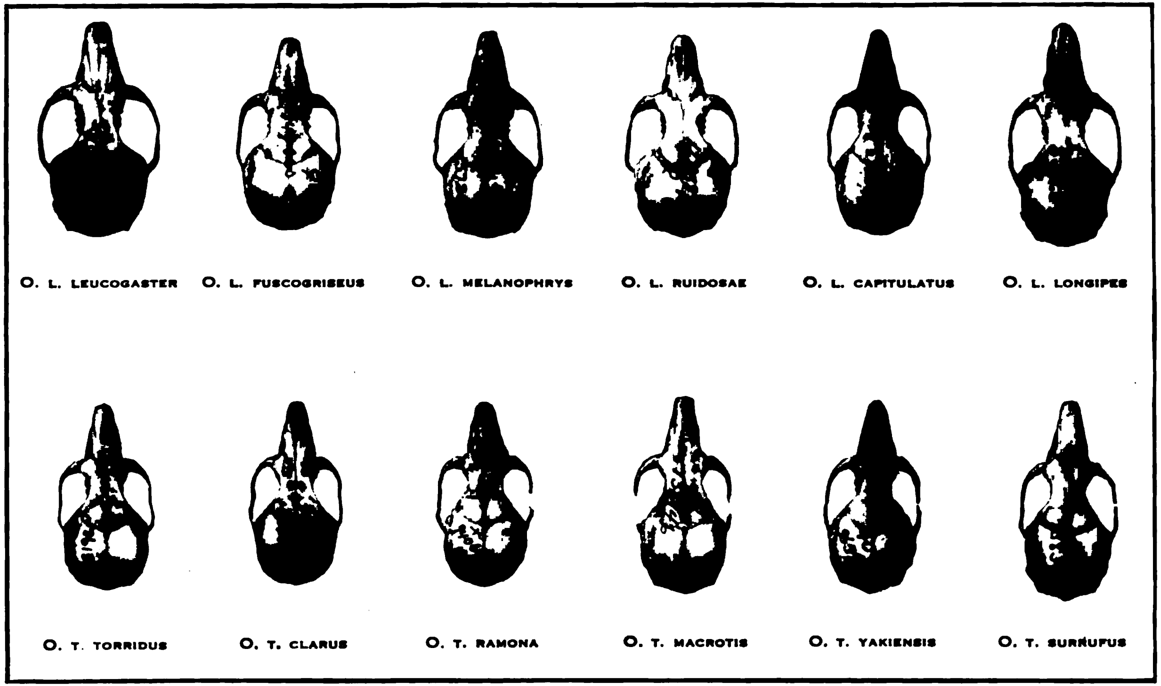

SKULLS OF ONYCHOMYS.

FOR EXPLANATION OF PLATE SEE PAGE 489.

# ORTHOPTERA OF THE YALE DOMINICAN EXPEDITION OF 1913.

By A. N. CAUDELL,

*Custodian of Orthoptera, United States National Museum.*

The Orthoptera collected by the Yale expedition to Dominica in 1913 comprises 57 specimens, representing 20 species. Two, a Phasmid and a Locustid, apparently new, are herein described. No more definite locality is given than that expressed by the following label, which is uniform for each specimen: "Dominica. June–July, H. W. Foote, Yale Exp. 1913."

By previous agreement types, uniques, and one-half of the remaining specimens are deposited in the United States National Museum.

## Family BLATTIDAE.

**PLECTOPTERA POEYI Saussure.**

One female. This specimen is somewhat larger than ones in the United States National Museum from the Greater Antilles and the United States, the elytra measuring 6 mm. in length. Synonymy very surely exists among the species of this genus and a revision is desirable.

**PANCHLORA HYALINA Stoll.**

Four females.

**EPILAMPRA CRIBROSA Burmeister.**

One female. This unique specimen seems to fit the description of *cribrosa* better than that of any other described form which might be expected to occur in Dominica.

**PYCNOSCELIS SURINAMENSIS Linnaeus.**

Two immature specimens.

In addition to the above roaches there is in the collection a very young nymph of a Blattid which I am unable to determine.

## Family PHASMIDAE.

**PARAPRISOPUS ANTILLARUM, new species.**

One female. Head densly covered with blunt tubercles, a broad transverse furrow between the eyes with a deep longitudinal sulcus above it and a couple of obscure slightly oblique longitudinal furrows, one on each side of the deep median sulcus; occiput with a pair of tubercles very slightly larger than the others, one on each side of the median sulcus. Antennæ heavy and basally flattened, especially the basal segment, which is barely longer than broad. Pronotum quadrate and covered with large tubercles, four, situated two on each side of the median line on the anterior half, somewhat larger than the others; just anterior of the middle of the pronotum is a deep transverse furrow and near the anterior border is a second shorter one. There is a pair of shallow posteriorly divergent furrows on the posterior part of the pronotal disk. Mesothorax about twice as long as the anterior width, the width noticably and gradually increasing from the front backwards; surface of mesonotum covered with large rounded tubercles, less elevated than those of the pronotum. Metanotum transverse, the surface covered with tubercles similar to those on the mesonotum. Median segment about twice as long as the metanotum and, like it, covered with bluntly rounded tubercles. Abdomen also covered with rounded tubercles, the segments very slightly longer than broad, the fourth, fifth, and sixth ones more distinctly so; operculum falling short of the end of the abdomen, barely exceeding the apex of the eighth segment, apically terminated by a short, blunt projection; cerci short and heavy.

Elytra present as small apically rounded lobes, broader than long and not reaching the posterior margin of the metanotum; wings immovable, fossil-like plates, their apical margin broadly rounded and coincident with that of the posterior margin of the metanotum.

Legs short, broad and heavy, all the femora broadly flattened and the margins, especially the lower margins of the middle and hind ones, undulately toothed or tuberculate; fore femora with the basal curve terminating two-thirds the distance from the base; middle femora but twice as long as broad, the hind ones about four times as long as broad. Tibiæ somewhat flattened and more or less distinctly undulate above. Tarsi heavy, and as long as the tibiæ, the anterior ones a little longer. All the legs are covered with tubercles similar to, but smaller than, those that cover the rest of the insect.

General color brownish with the tubercles mostly ash-colored, especially those on the head and pronotum; eyes dark brown; there is some black on the occiput and on the front part of the pronotum; some of the segments of the antennæ are darkened basally, giving it a ringed appearance; the tibiæ are variegated with blackish and the hind and middle femora are black on the inner face.

Measurements: Length, entire insect, 63 mm.; pronotum, 4; mesonotum, 8; metanotum, 2; fore femora, 7; middle femora, 5; hind femora, 8; width, head, 5; middle femora, 2.5.

*Type.*—Cat. No. 18242, U.S.N.M.

The type is unique.

## Family ACRIDIDAE.

**ORPHULELLA PUNCTATA DeGeer.**

Nine males, twelve females, and one female nymph.

The above series of this common species exhibits much variation but no extremes not paralleled by specimens in a series of some 300 or more in the United States National Museum collection from Paraguay, named by Professor Bruner.

## Family LOCUSTIDAE.

**MICROCENTRUM DIVISUM Walker.**

Two males. This species will very surely prove synonymous with some one of the later described species of Brunner.

**NEOCONOCEPHALUS GUTTATUS Walker.**

One female. The *Conocephalus exaltatus* of Walker seems very near this species and may indeed be the same.

**CONOCEPHALUS PROPINQUUM Redtenbacher.**

One adult male and a female nymph.

**LEUROPHYLLUM LURIDUM Brunner.**

Two males. These specimens are a little larger than the measurements given in the original description.

**LICHENOCHRUS FULVICOSTA, new species.**

Four females. General color greenish mottled with dark brown. Head with front retreating; fastigium of the vertex small and declivent, not nearly as broad as the basal segment of the antenna and apically pointed, the whole sunk deep between elevated antennal scrobae, the tip below that of the frontal fastigium, which is apically tuberculate; basal segment of antenna armed on the inner side with a long spur, more than half as long as the segment. Pronotum subsellate, without lateral carinae, the disk anteriorly roundly produced, posteriorly less so, the surface uneven but scarcely ruggose, the transverse sulci very distinct; lateral lobes twice as long as high, the lower margin horizontal and with a shallow intromarginal sulcus. Abdomen plump, the ovipositor heavy, very little curved upwards, lower margin regularly curved, the upper margin straight in basal half or a little more and then tapering to the pointed apex in an almost straight line, the margins almost smooth, very slightly undulately toothed.

Legs long and stout; all the femora armed beneath on the cephalic margin only, the fore ones with four, the middle with five or six, and the hind ones with about a dozen stout spines, those of the hind femora especially much flattened; all geniculations briefly but acutely spined; all tibiæ armed beneath on both margins with several short stout spines; fore tibiæ unarmed above or with one or two small spines on the caudal margin in the apical half, none apical; middle tibiæ armed above on the caudal margin only with 4 or 5 spines, none apical; hind tibiæ with both dorsal margins bearing long, basally flattened, backward curving spines, an apical one on the inner margin only. Tarsi broad and flat, especially the third segment.

Elytra slightly longer than the wings when folded, extending a fifth their length beyond the tips of the hind femora; costal and anal margins almost equally and uniformly curved, the tips narrowly rounded. Wings nearly as broad as long, uniformly and deeply fuliginous with even darker cross-veins except a broad grayish-brown strip along the costal margin and extending from the base to near the apex and as broad mesially as the pronotal width.

Face, like the entire head except the brown eyes, light yellowish brown, the mandibles blackish apically and the clypeus and labrum very slightly margined laterally with darker color; antennæ brown, with some lighter segments here and there. Abdomen generally yellowish brown, the sides of the last segment shining piceous, the ovipositor yellowish basally and black apically. Legs greenish brown mottled with black, the black mottling of the tibiæ sometimes gathered into the form of illy defined obscure bands. Elytra greenish with blackish mottlings; wings colored as described above.

Length: Pronotum, 10 mm.; fore femora, 18; middle femora, 17; hind femora, 37; elytra, 65; wings, 57; ovipositor, 37. Width: elytra, at the middle, 18; wings, at widest part, 46; ovipositor, at middle, 5.5.

*Type.*—Cat. No. 18252, paratype No. 18252*a* U.S.N.M.; paratypes 18252*b* and 18252*c* Yale University.

The paratypes are about as the types except that the general color is dark brownish, the green of the type specimen being mostly absent.

The armature of the anterior tibiæ seems very variable. In the type-specimen and paratype *a* one of these tibiæ, the left, is wholly unarmed above while the opposite one has one small spine at about the apical fourth. Paratype *b* has the left with one small spine and the right unarmed and paratype *c* has two spines on the left one and one on the right.

In general this species bears some superficial resemblance to the insect described and figured by Redtenbacher as *Bliastes striolatus* but in structure it is very different.

**LUTOSA CUBENSIS Haan.**

One female.

## Family GRYLLIDAE.

**CRYPTOPTILUM ANTILLARUM Redtenbacher.**

Two females. The measurements of these two specimens are somewhat less than those given by Redtenbacher for the types from St. Vincent and the form is a little more slender than United States specimens in the National Museum collection determined by Rehn and Hebard. But these Dominican specimens are badly rubbed and show some indications of immaturity.

**ANUROGRYLLUS MUTICUS DeGeer.**

One female. The lateral lobes of this brachypterous specimen are almost wholly blackish, showing variation toward the larger *A. fuscus* Caudell from Peru. This latter species may prove to be but of varietal distinctness. An interesting malformation of the male type of this Peruvian form is presented by the metatarsus of the left hind tarsus, which is unarmed above.

**GRYLLODES RUFIPES Redtenbacher.**

One adult female and three nymphs, one a nearly mature female and two smaller males.

The adult female, which has the end of the ovipositor broken off, agrees with the original description of the species except that the elytra are not separated above. This may indicate a different species, a variation or a difference due merely to a shriveling of the type specimen in drying. This can be definitely determined only when more material from the Lesser Antilles is available for study.

**LARANDUS MARMORATUS Redtenbacher.**

One female. This specimen, the first of its sex known I believe, seems to resemble the male, as described by Redtenbacher from St. Vincent, except that it is entirely apterous and measures as follows: Length, pronotum, 3 mm.; posterior femora, 11; ovipositor, 7; width, pronotum, 3.5; hind femur at widest part, 3.25.

The ovipositor is moderately curved upward and the tip is considerably broadened and spear-shaped, the valves almost unarmed. The cerci are almost one half longer than the ovipositor.

**CYRTOXIPHA IMITATOR Saussure.**

One male. This specimen seems specifically identical with the male recorded by Rehn from Cuba.

**AMPHIACUSTA CARAIBEA Saussure.**

One male.

**OROCHARIS, species.**

Two males, one female. In spite of the fact that these specimens are in fairly good condition I am unable to place them with certainty. They are probably what has been sometimes recorded from the Antilles as *Orocharis gryllodes* or *O. saulcyi* but they differ from both these species as represented in the collection of the United States National Museum. *Orocharis*, like so many of our orthopterous genera, is in need of revision.

# A PECULIARITY IN THE GROWTH OF THE TAIL FEATHERS OF THE GIANT HORNBILL (RHINOPLAX VIGIL).

By Alex Wetmore,

*Of the Biological Survey, United States Department of Agriculture.*

Sometime ago Dr. C. W. Richmond, of the United States National Museum, called my attention to certain peculiarities in the rectrices of the Giant Hornbill (*Rhinoplax vigil*) and the following notes are the outcome of his kindness in allowing me to examine the material under his care [1]. Nine specimens, six males and three females, of this fine bird are at hand, all collected by Dr. W. L. Abbott. In none of these are the rectrices perfect as will be noted in the detailed description below, and it was this fact that first drew attention to them in Doctor Richmond's search for a specimen to be mounted and placed on general view. The elongated median tail feathers at once catch the attention on examining this Hornbill, and their length is no less extraordinary than the apparent manner of their growth to which I believe attention has not been called previously.

Ten rectrices are found in the completely developed tail of this bird, eight outer feathers of moderate size and two central feathers, which when completely developed, are from 2 to 3 feet in length. The only apparent difference between male and female in the growth of the tail is that of relative size, the male being the larger bird.

Following is a brief description of the condition of development of the caudal feathers in the specimens at hand, arranged in chronological sequence:

Cat. No. 159447, U.S.N.M.; female; Lay Song Hong, Trong, Lower Siam, September 16, 1896. The eight lateral tail feathers are all present but of the central pair, one long feather, faded in color and somewhat worn, is developed. On the right side a second long feather, bright and new in color, is growing with its tip about one and one-half inches beyond the shorter lateral feathers.

Cat. No. 159448, U.S.N.M.; male; Lay Song Hong, Trong, Lower Siam, September 24, 1896. The eight outer rectrices are fully grown and one long central feather somewhat worn appears on the left side.

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[1] To Mr. H. C. Oberholser thanks are due for suggestions during the preparation of this paper.

Its coordinate on the right has attained two-thirds the length of the lateral retrices.

Cat. No. 181104, U.S.N.M.; male; Aru Bay, East Sumatra, November 18, 1905. In this bird seven of the lateral paired feathers are fully developed with an eighth outermost just appearing on the right side, while its mate on the left has evidently been fully developed for some time. The fourth from without on the right is a bright clean feather which has not quite attained its growth, a small portion at the base being still inclosed in a sheath, while the corresponding feather on the left is old, much worn, abraded at the tip, and dull in general color. Of the central pair, the left feather is longer and is faded and much worn, while the right rectrix, 6 inches less in length, is still growing as is shown by the sheath-inclosed base.

Cat. No. 159449, U.S.N.M.; female; Lay Song Hong, Trong, Lower Siam, November 21, 1896. The four outer pairs of rectrices are developed normally, while one alone of the central feathers is fully grown and it is faded and somewhat abraded. At its base on the left side is the other member of the median pair, a bright, new, developing feather three-fourths as long as the outer rectrices.

Cat. No. 181105, U.S.N.M.; male; Aru Bay, East Sumatra, January 1, 1906. The eight shorter feathers are intact and comparatively new. The right member of the central pair is fully developed and in fair condition as regards color and abrasion; while its companion on the left is one-fourth the length of the lateral rectrices and has just broken its sheath.

Cat. No. 180966, U.S.N.M.; male; Tarussan Bay, West Sumatra, January 9, 1905. The tail is well developed, the four outer pairs of rectrices being entirely bright and new. One long feather on the right side is comparatively new, showing few signs of wear. Its companion on the left shows only in that the sheath projects one-half inch beyond the skin of the pygal elevation and as yet shows no sign of breaking to allow the vane to expand.

Cat. No. 181699, U.S.N.M.; male; Balik Papan Bay, East Borneo, February 9, 1909. This specimen has three of the outer feathers on the left side fully developed, the second from the outside being one-third as long as the others. On the right half only two feathers are fully developed; the first is just breaking its sheath and the second is one-half as long as its fully grown companions. Of the median pair, the left is longer while its parallel on the right is a trifle shorter and is evidently older and in poorer condition, being worn at the tip nearly to the shaft.

Cat. No. 181249, U.S.N.M.; male; Sungei Makapan, East Sumatra, February 18, 1907. The right member of the fourth pair barely shows as a projecting quill from the uropygium, while its companion on the left is double its length and is just breaking the tegumentary sheath.

The central feathers are identical in condition with those in the bird immediately preceding except that the right rectrix is the longer and younger as is shown by its color and condition as regards wear.

Cat. No. 181250, U.S.N.M.; female; Makapan, East Sumatra, February 20, 1907. The eight lateral tail feathers are present and but one fully developed central feather on the right side, which has the vane faded and broken below the distal extremity. On the left its mate has grown out until it is 4½ inches longer than the lateral rectrices.

It will be noticed at once that in none of these nine birds which have been critically examined are both feathers of the central pair equal in length, apparent age, or development. In the three birds (Nos. 181104, 181699, and 181249) in which both feathers are approximately the same length one of them is noticeably a feather of a previous molt which is about to be shed and which is so worn and abraded that part of the shaft has been broken off, leaving it shorter than the newer feather. The other specimens all have one central feather fully grown and the other at different stages of development from a newly appearing pin feather barely projecting beyond the flesh to a bright new feather more than three-fourths the length of its companion.

From these facts it is evident that but one of these feathers is developed at one time. This feather grows to full length and is retained at the next molt while another starts on the opposite side. When this second feather attains its growth the two are found together for a short time until the old rectrix is shed, leaving the newly developed feather as a projecting vane in the tail, when the process is repeated. Curiously enough each new feather, whether on the right or left side, grows out beneath the vane of the older feather, thus securing protection from abrasion and fading until mature.

The long feather is apparently dropped sometime between December and March, though I have not been able to ascertain the exact time or the age which these feathers attain, as the nine birds studied come from four separate localities, and different climatic conditions undoubtedly modify the breeding season and so change the time of the post-breeding molt. However, between September and January six birds are found to have these feathers of unequal length and in two specimens collected in February the new feather is fully grown and the other still in its place, while signs of growth are present in the other feathers, pointing to a duration of two years for each of these giant rectrices, though it may be found that they are renewed at shorter intervals, each one, however, being retained more than a year. It is very evident that these feathers remain in position for more than one year, from the great wear and fading which they show when compared with the other tail feathers and the remiges.

Other irregularities are apparent in the molt of the bird as in four specimens from eastern Sumatra taken from September to February one or more primaries is found to be in an undeveloped condition, and variation is shown in the renewal of the shorter pairs of lateral rectrices.

To summarize, in the Giant Hornbill (*Rhinoplax vigil*) but one feather of the central pair is developed at one time and this spike, much longer than the other rectrices, on reaching maturity, remains in position for more than a year, probably for two. Its companion, beginning its growth after the other has gained its extreme length, then equals it in size. The first feather is then molted and is gradually replaced by another, so that in the renewal of this central pair there is a continual alternation instead of the usual method by which these feathers are renewed synchronously on the right and left sides. It is difficult to determine how this peculiar situation has been brought about, but it is apparently an interesting case of aberrant evolution.[1]

Upon the facts as outlined above, we may, however, base the hypothesis that originally a Hornbill with tail feathers more or less equal in length, through some accident retained a central feather which grew, outstripping its fellows until it had more than doubled their size and then later was cast off. In the meanwhile its companion attained an equal length, reaching maturity before the fall of the first feather and, remaining in position, maintained the peculiar spike-like form unique in this genus among the Hornbills. That this change has been rather recent is testified by the fact that these long central feathers have a broad white tip and a black subapical band conforming exactly in width and color to the bands found on the shorter lateral feathers.

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[1] Since this was written three additional specimens of this Hornbill, collected by Mr. H. C. Raven, have been received from Borneo, as follows: Cat. No. 182804, U. S. N. M., adult male, Sungei Karangan, October 28, 1913; Cat. No. 182805, U. S. N. M., young female, Sungei Karangan, December 8, 1913; Cat. No. 182806, U. S. N. M., adult male, Sungei Pelawan, January 5, 1914.

The two adult males exhibit the same peculiarities as the series discussed above. In each bird one of the central rectrices is worn and abraded, while its companion is bright and new. In the October specimen the new feather is three inches shorter than its older companion, while in the January bird the two are about equal, and the older feather would soon have been dropped.

Great interest, however, attaches to the development found in the immature specimen. This bird is about three-fourths grown, the primaries are still shorter than the secondaries and are worn and dirty, as though the bird had recently left the nest, and the huge knob on the culmen is in the early stages of growth. In the tail THE SAME CONDITION IS NOTED AS IN THE ADULTS. The right feather of the central pair of rectrices is worn and broken, one third being gone. The left rectrix while worn is evidently a newer feather. As in the adults the new feather grows out under the old one. From this it is evident that a single median tail feather grows out to full length while the bird is STILL IN THE NEST. Whether another feather appears with it to be pushed out by one following later can be determined only from more material.

# NOTES ON WOLFRAMITE, BERAUNITE, AND AXINITE.

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By Edgar T. Wherry,

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## OBSERVATIONS ON WOLFRAMITE.

The studies herein presented were undertaken at the suggestion of Mr. Frank L. Hess, of the United States Geological Survey, who desired information as to the composition of these two occurrences of wolframite.

No. 1 is a large specimen in the exhibition collection of the Museum (Cat. No. 80179), labeled "Cornwall, England," although unfortunately with no statement as to the exact mine or district from which it came. It shows, however, the characteristic features of the mineral as found in that region, occurring as long bladed crystals, with granular chalcopyrite, in white vein quartz. Along cracks in the solid wolframite a yellowish powder is developed, which apparently represents an alteration product, although the amount is too small to determine its character.

No. 2 is a mass about 6 by 9 by 12 cm. in size, showing a very black wolframite intimately associated with bright green chrysocolla, with here and there between the two, as well as throughout the wolframite, streaks of an olive green, waxy, copper tungstate mineral. The associated gangue minerals are microcline and gray quartz, the occurrence being evidently in a pegmatite vein. It came from Cave Creek, north of Phoenix, Arizona, and was presented to the Museum by Mr. S. H. Brockunier, through Mr. Hess (Cat. No. 87283).

Material for analysis was selected from portions free from visible impurities, finely powdered and dried in a dessicator over sulphuric acid. Preliminary trials of the method of distillation in a stream of sulphur monochloride mixed with chlorine, recently recommended by Bourion,[1] gave rather unsatisfactory results in that it was extremely difficult to recover all the tungsten, some of it sticking to the glass apparatus, and further, although most of the manganese and all the silica, calcium, copper, and magnesium remained behind in the boat, some iron was also left, so that it was necessary to run both the residue and the distillate through the whole course of analysis.

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[1] Ann. chim. phys., ser. 8, vol. 21, 1910, p. 87.

The method of fusion with sodium carbonate as outlined by Treadwell[1] was therefore adopted, although modifications had to be introduced to obtain the copper in No. 2. The rare metals were also separated by the course recommended by Treadwell, that of decomposition by nitro-hydrochloric acid. It was found that on washing the residue insoluble in ammonia with pure water, the oxides of columbium and tantalum tended to become colloidal and run through the filter paper, a turbid filtrate under these conditions constituting a very delicate test for their presence; adding a little ammonium nitrate to the wash water coagulated them again, however, and permitted their retention on the filter.

In sample 1 the unusually high value of 0.80 was obtained for calcium. As it seemed of interest to know whether this was due to included calcite gangue, or to scheelite, half a gram was ignited for 30 minutes in a platinum crucible at the highest temperature of a modern complete combustion burner, and tested with neutral phenolphthalein solution. Not the slightest alkalinity was shown, although calcite should have been readily decomposed under these conditions. It was then thought that treatment with tartaric acid might throw some light on the question. Half a gram of the sample was heated on a steam bath with a solution of 10 grams of tartaric acid in 50 cc. of water for three hours, the undecomposed mineral filtered out, and ammonium hydroxide and ammonium oxalate added to the filtrate. On standing overnight a precipitate of calcium oxalate came down, which on being filtered out, ignited, and weighed, gave 0.82 per cent, showing that all the calcium had gone into solution. In the filtrate from the calcium oxalate ammonium sulphide gave a black precipitate of ferrous sulphide, which was filtered out, dissolved in hydrochloric acid, and its iron precipitated with ammonium hydroxide and weighed as ferric oxide. A small amount of manganese oxide, determined as 0.07 per cent, was also recovered here. The filtrate, from which iron, manganese, and calcium had now been completely removed, was evaporated to dryness three times with concentrated nitric acid to destroy the tartaric acid, and the separated tungsten trioxide dissolved off the dish with ammonium hydroxide, and poured through a filter into a crucible in which it was ignited and weighed as tungsten trioxide. The amount of tungsten trioxide obtained was not sufficient to satisfy all of the bases, but it seemed most probable that it had been united with all of the calcium and part of the iron.

To determine whether scheelite is soluble in tartaric acid, some clear crystals were broken from a specimen from Zinnwald, powdered, and

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[1] Quantitative Analysis, translated by W. T. Hall, 3d edition, 1911, p. 296.

0.2250 gram heated on the steam bath with 10 grams tartaric acid dissolved in water, for two days. The amount of powder was seen to gradually decrease, and that remaining at the end of this period weighed only 0.0302 gram, representing thus only about 15 per cent of the original material. This would no doubt have dissolved completely had it been finely enough powdered, or had the heating been continued longer, so it is evident that scheelite is essentially soluble in tartaric acid. This reagent therefore can not be used to differentiate scheelite from calcite as an impurity in wolframite, but in the present case the failure to obtain an alkaline reaction on ignition seems clear evidence of the absence of calcite, so the calcium has all been regarded as in the scheelite form. As noted in the description of the mineral, a yellowish powder is visible in some cracks on the specimen; although everything of this sort was carefully removed from the material used for analysis, the presence of invisible cracks along which incipient alteration by calcium-bearing solutions has occurred is quite within the range of possibility.

The tartaric acid dissolved from the wolframite 4.16 per cent of tungsten trioxide. The 0.82 per cent of calcium oxide found would be united with only 3.40 per cent, if in the form of scheelite, so that 0.76 per cent tungsten trioxide remains to be accounted for. But 0.90 per cent ferric oxide and 0.07 manganous oxide were also found to be dissolved. The manganous oxide would take 0.23 tungsten trioxide, leaving 0.53 which was united with ferrous oxide. The amount of ferrous oxide corresponding would be, however, only 0.17 per cent (0.20 as ferric oxide), which, subtracted from the total ferric oxide found, leaves 0.70 free ferric oxide which was dissolved by the tartaric acid. This, which is perhaps present as limonite, has been listed separately in the analysis, the equivalent amount of ferrous oxide, 0.63 per cent, having been subtracted from the total ferrous oxide found. But on calculating the mineral composition of the original material, following Mr. Hess's plan of assigning the tungsten first to the manganese, calcium, magnesium, etc.,[1] a total excess of ferric oxide of 2.2 per cent was found. Since the form of the remaining 1.5 per cent of this is indeterminate, it has been necessary to include it with the ferrous oxide, although it may be present as a ferric oxide insoluble in tartaric acid, perhaps hematite, or possibly in solid solution (see below). Mr. Hess [2] has found such an excess of iron to be very frequent in wolframite.

No. 2 was fused with sodium carbonate at as low a temperature as possible, to prevent alloying of any of the copper with the platinum crucible, and then, when the oxides insoluble in water were dissolved in acid, the copper was first precipitated by hydrogen sulphide before the determination of the iron and manganese, and weighed as oxide, after repeated ignition with dry ammonium carbonate. Here the calcium was only moderate in amount, but the columbium and tantalum oxides seemed sufficiently high to attempt to determine the relative amounts of the two.

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[1] U. S. Geol. Surv., Bull. 583, 1914, p. 21.

[2] Idem, p. 38.

For this purpose the oxides were fused with potassium acid fluoride, reprecipitated, and ignited as recommended by Foote and Langley[1] and the specific gravity then determined. Although the impossibility of duplicating the conditions exactly renders the result uncertain, it is probably quite as dependable as that obtained by any of the direct methods of determination. The 2.20 per cent of mixed oxides obtained had a specific gravity of 7.02, corresponding to about 2/3 tantalum, so that the percentages of the two oxides are stated as tantalic oxide 1.50, columbic oxide 0.70. No tin or titanium could be detected in either sample of wolframite.

| Analyses. | | | Calculated mineral compositions. | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | | | 1 | 2 |
| $FeO$ | 10.81 | 18.18 | Ferrowolframite | $FeWO_4$ | 39.1 | 75.9 |
| $MnO$ | 12.55 | 3.37 | Manganowolframite | $MnWO_4$ | 53.5 | 14.2 |
| $CaO$ | 0.80 | 0.24 | Calcioscheelite | $CaWO_4$ | 4.1 | 1.2 |
| $MgO$ | 0.12 | ........ | Magnesioscheelite | $MgWO_4$ | 0.8 | ........ |
| $CuO$ | ........ | 1.34 | Cuproscheelite | $CuWO_4$ | ........ | 5.3 |
| $WO_3$ | 74.84 | 73.74 | Ferrotantalite | $Fe(TaO_3)_2$ | 0.1 | 1.5 |
| $Ta_2O_5$ | 0.26 | 1.50 | Manganotantalite | $Mn(TaO_3)_2$ | 0.1 | 0.3 |
| $Cb_2O_5$ | | 0.70 | Ferrocolumbite | $Fe(CbO_3)_2$ | 0.1 | 0.7 |
| $SiO_2$ | 0.30 | 0.72 | Manganocolumbite | $Mn(CbO_3)_2$ | 0.1 | 0.2 |
| $Fe_2O_3$ | 0.70 | ........ | Quartz | $SiO_2$ | 0.3 | 0.7 |
| | 100.38 | 99.79 | Iron oxides | $Fe_2O_3$, etc | 1.8 | ........ |
| Sp. gr. | 7.272 | 7.162 | Total | | 100.0 | 100.0 |

1. Wolframite, Cornwall, England. U. S. Geol. Surv., Bull. 583, p. 27.
2. Wolframite, Cave Creek, Arizona. *Idem*, p. 32.

In calculating the approximate mineral composition of 1 it was assumed that the only free base was the iron oxide, that the iron manganese ratio was the same in the columbite-tantalite as in the wolframite, and that equal proportions of columbium and tantalum were present.

In calculating that of 2 it was again assumed that the iron and manganese were present in the columbite-tantalite in the same ratio as in the wolframite, and that the deficiency in the summation of the analysis was due to the manganese being too low.

A few words should be added concerning the nomenclature here adopted.[2] The names wolframite, scheelite, columbite, and tantalite are used as series names, that is, as referring to any and all intermediate members of the isomorphous series, no matter what the relative proportions of the bases are. For the theoretical end members, chemical prefixes are applied to these roots.[3] This method is preferred to the use of distinct names for the end members because, while both are ambiguous in being ordinarily used for quite distinct things, it seems simpler to restrict the chemical terms to one meaning. Thus, both ferrowolframite and ferberite may be used either for pure ferrous tungstate, or for a ferrous tungstate containing a little manganese isomorphously replacing the iron; manganowolframite and hübnerite for either pure manganese tungstate or manganese tungstate containing a few per cent of iron in isomorphous replacement; cuproscheelite and cuprotungstite for various mixtures of copper and calcium tungstates, etc.

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[1] Amer. Journ. Sci., ser. 4, vol. 30, 1910, p. 393.

[2] Which represents an extension of that proposed in Science, vol. 39, 1914, p. 575.

[3] The end members are described as theoretical because they can not be expected to occur in nature, elements being apparently never found free from at least small amounts of their isomorphs. Their chemical-prefixed names should therefore not be included in "lists of new mineral names."

If mineralogy is ever to have anything like a quantitative system of nomenclature, such ambiguity will have to be avoided, and it seems to the writer that the best way to avoid it will be through restricting the use of words with chemical prefixes to the end members, whether found in nature or not, and doing away with distinct names for them. The method used in the well-known quantitative classification of igneous rocks could be adopted here, using the prefixes: Permangano when Mn: Fe is greater than 7: 1; domangano between 7:1 and 5:3; ferromangano between 5:3 and 3:5; doferro between 3:5 and 1:7; and perferro less than 1:7. Named according to this plan, the wolframite from Cornwall would be ferromanganowolframite and that from Cave Creek doferrowolframite. Such names are of course too cumbersome for everyday use, although it is possible that in certain cases they might be employed with advantage for purposes of classification or comparison. It is especially urged, however, that they, like those of end members, be omitted from lists of mineral names, for arbitrarily partitioned-off portions of isomorphous series are not to be regarded as definite minerals.

It is of course impossible to refer in the names to all constituents of the minerals, but that does not mean that some of the minor ones are not of considerable importance; and the significance of the columbium and tantalum found in these samples is certainly worth discussing. In the table of calculated mineral compositions these have been regarded as united with iron and manganese, to form the columbite and tantalite molecules. No columbite and tantalite are present as visible inclusions, for the brilliant cleavage surfaces of the wolframites look perfectly uniform under the microscope. But they might exist either 1, in chemical combination; 2, as submicroscopic inclusions; in one of the types of solid solution: 3, isomorphous replacement; or 4, mix crystals; or, finally, 5, as an adsorption compound. The tendency of the "metallic acids"—columbium, tantalum, titanium, tungsten, vanadium, etc.—to enter minerals in these ways is very evident when the variability in composition of many columbates, of the titaniferous magnetites, etc., is considered. But various interpretations have been put on it by different observers.

Thus Dr. J. T. Singewald, jr.,[1] concluded that the presence of titanium in magnetites showing no visible ilmenite intergrowths proved the existence of a "titanomagnetite"; but he had found the lamellas of ilmenite to vary continuously from 4 mm. down to 0.001 mm. in length, and there is no reason at all why they should cease to exist at just the latter size, for the limit of microscopic visibility is determined by the wave length of light, and has no significance as far as the molecules are concerned, a particle of this size containing thousands of molecules. So submicroscopic inclusions may well account for much of the titanium. Stopford Brunton,[2] from similar studies, assumed the titanium to be present in "solid solution," but evidently used this term to cover all cases where no inclusions are visible, making no attempt to differentiate the various possibilities listed above. It seems to the writer that we should be more specific in stating just what mode of combination the evidence favors in any particular case, so the data in regard to wolframite will be further discussed here.

The absence of the elements columbium and tantalum from some specimens of the latter mineral, and their variable amount when found, clearly indicate that they are not chemically combined with the tungstates. That their presence might be due to inclusions of columbite and tantalite has been suggested,[3] without definite proof; and only the existence of visible inclusions would justify the assumption of submicroscopic ones, as in the titaniferous magnetites above mentioned. There remain, therefore, only the possibilities of solid solution and adsorption, 3, 4, and 5.

A solid solution, according to van't Hoff, the first to employ the term, is a solid homogeneous complex of two or more substances, the relative proportions of which may vary, but the homogeneous character be retained.[4] Two principal types can be distinguished, isomorphous replacement, where the substances are closely related chemically and may be regarded as taking one another's places in the point system constituting the crystal structure; and mix-crystal formation, where the substances are so different in character that mutual replacement is out of the question. The formation of mix crystals, in which, as has been shown more especially by O. Lehmann,[5] two or more crystalline substances grow together so intimately that they appear homogeneous under the microscope, yet mutually affect one another as to crystallization, producing changes in habit, crystal angle, optical properties, etc., is probably a much more frequent and important phenomenon than is ordinarily supposed. It takes the place in crystalline substances that adsorption does in colloids, and, indeed, is probably the same effect. At least it is among the elements the compounds of which show the greatest tendency to take on the colloidal form that mix crystal formation is most frequent.

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[1] Econ. Geol., vol. 8, 1913, p. 207; U. S. Bureau of Mines, Bull. 64, 1913.

[2] Idem, p. 670.

[3] Damour, Bull. soc. géol. France, ser. 1, vol. 2, 1848, p. 108; Hess, *loc. cit.*

[4] Zeits. phys. Chemie, vol. 5, 1890, p. 323.

[5] Zeits. Kryst. Min., vol. 1, 1877, p. 453; vol. 6, 1882, p. 48, p. 580; vol. 12, 1887, p. 399, etc.

Tungsten and columbium are alike only in that both can act as anions toward the more strongly electro-positive elements, and different in practically every other chemical property—in valence, behavior with reagents, etc.—so that they can not be expected to replace each other isomorphously. The most reasonable explanation of the condition of the columbium and tantalum oxides in wolframite is, then, that they are present as mix crystals, or, in other words, that the several point systems have interpenetrated to such an extent that they have become at least pseudohomogeneous.[1] Wolframite is of course not susceptible to optical examination, nor can any crystal angle measurements be made on the present specimens, but if they could be so studied effects such as those shown by other mix crystals would no doubt be observed. Such intergrowth produces marked effects on the crystal angles of the columbite group of minerals, which, as will be more fully explained elsewhere, are probably to be regarded as composed of mix crystals of a very few fundamental compounds; the principal ones, the compositions of which are $R''Cb_2O_6$ and $R''Ta_2O_6$, are trimorphous, having isometric, tetragonal, and orthorhombic forms; so that, even admitting that the analyses of members of this group are to some degree correct, the number of "species" into which it should be separated is greatly overestimated.

In summary, two wolframites have been analyzed and their compositions discussed, a standard nomenclature for such isomorphous mixtures recommended, and the columbium and tantalum oxides found shown to most probably exist in mix crystal form.

## A NEW OCCURRENCE OF BERAUNITE.

The rare iron phosphate beraunite was discovered near Hellertown, Northampton County, Pennsylvania, by the department of geology of Lehigh University in 1911. The exact locality is the northeast corner of an abandoned iron-ore pit, 1 mile southeast of the center of the town. It was analyzed by Mr. J. S. Long, assistant in the department of chemistry, and later more thoroughly studied by Mr. Louis H. Koch, assistant in mineralogy, as part of the work for his degree of master of science at Lehigh. Specimens were brought by the writer to the United States National Museum (Cat. No. 87284), and further investigated and the combined results of all the work are here presented.

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[1] The apparent excess of iron oxides, if not due to analytical errors, may be explained in the same way, which would be favored by their similar crystallization: Prior, Mineralogical Magazine, vol. 13, 1903, p. 217.

The material shows a deep brown nodular crust up to 5 mm. thick, and flat radiations up to 1 cm. in diameter, on the surface of an iron-stained quartzite. In some specimens it bears implanted globules of psilomelane, yellow needles of cacoxenite, and powdery clay. Internally the crusts are coarsely fibrous, with the fibers perpendicular to the surface, and the material was evidently originally a gelatinous precipitate, which has become hard and crystalline in place, thus representing a "meta-colloid," as defined by the writer in a recent paper.[1]

After a preliminary analysis (1) had shown the general nature of the mineral, material for further study was obtained by crushing selected fragments, and the powder looked completely crystalline and homogeneous under the microscope, except for the presence of a trace of clay or fine sand. Standard methods of analysis were used, the iron being determined with permanganate, the manganese by the bismuthate and the Ford methods, and the phosphorus weighed as magnesium pyrophosphate after separation by molybdate. A small amount of water—less than 0.5 per cent—was given off below 100°, and the analyses were made on coarsely powdered material dried at this temperature, for the fineness of the grinding and the humidity of the air were found to have a distinct effect on the water content.

*Table of analyses.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| $Fe_2O_3$ | 42.91 | 52.65 | 55.61 | 57.80 | 57.89 | 58.69 | 4.5 |
| $Mn_2O_3$ | 15.25 | 3.88 | 1.80 | 1.66 | | | 50.5 |
| $P_2O_5$ | 28.10 | 29.27 | 28.53 | 27.43 | 28.33 | 28.71 | 3.2 |
| $H_2O$ | 10.01 | 13.59 | 13.54 | 12.60 | 12.43 | 12.60 | 22.1 |
| $SiO_2$ | 4.02 | 0.71 | 0.34 | 0.55 | 1.41 | .......... | 12.0 |
| | 100.29 | 100.10 | 99.82 | 100.04 | 100.06 | 100.00 | (92.3) |

1. Analysis by J. S. Long.
2. Analysis by Louis H. Koch.
3, 4. Analyses by the writer.
5. Average of the preceding, uniting $Fe_2O_3$ and $Mn_2O_3$, which are evidently isomorphous.
6. Same, corrected by removing the $SiO_2$ and recalculating to 100°. Ratios, $R_2O_3:P_2O_5:H_2O = 1.82:1:3.47$.
7. Partial analysis of the associated psilomelane, by Mr. Long. Alkalies and alkaline earths present but not determined.

These analytical results apparently do not indicate any simple, fixed formula for the mineral, nor do they establish its identity with any previously described species; although inspection of the analyses, and the formulas derived from them, of the various "species" of ferric phosphates in Dana's System, shows that similar difficulties have been encountered in this group of minerals before. The Hellertown mineral agrees in specific gravity and optical properties, however, with beraunite. The specific gravity, determined by a pycnometer, varied from 2.850 to 2.920; Dana gives 2.95. The indices of refraction were found to be approximately $\alpha$ and $\beta = 1.78$, $\gamma = 1.81$, extinction straight (elongated parallel to b.), and sign of elongation —. No optical data have been published for beraunite, but Dr. E. S. Larsen, of the United States Geological Survey, kindly examined for comparison a specimen of the variety "eleonorite" (U.S.N.M. Cat. No. 80622) from the type-locality at Giessen, Germany, and obtained the values: $\alpha = 1.775$, $\beta = 1.786$, $\gamma = 1.815$, which are essentially the same as those above given.

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[1] Journ. Wash. Acad. Sci., vol. 4, 1914, p. 112.

Two possible explanations of the variation in composition shown suggest themselves. The first, that the law of definite proportions does not hold in this, and other iron phosphates, would be capable of introducing a rather chaotic condition into mineral chemistry, and seems entirely improbable. If the mineral were a colloid, however, the results could at once be interpreted in a second way—that the mineral is an adsorption compound of ferric and manganic hydroxides with phosphoric oxide and water. It is, however, a meta-colloid, that is, a colloid which has become crystalline without dissolving or losing its solidity. If, when this crystallization took place, the adsorbed constituents united as well as they could into definite compounds which formed mix crystals (or, as it is often called, solid solution), the results obtained could easily be accounted for.

The $R_2O_3:P_2O_5$ ratio shown here varies from 1.72:1 in No. 2 to 1.93:1 in No. 1, while that indicated by the best previous beraunite analyses is 1.50:1, and the best dufrenite analyses, 2.00:1. The simplest explanation of the variation and indefinite ratios shown by the specimens under investigation is that they represent mix crystals (solid solutions) of these two fundamental compounds. The dufrenite molecule is in excess over the beraunite, although the properties are those of the latter mineral; it might therefore be called dufreniberaunite.

## AXINITE FROM DELAWARE COUNTY, PENNSYLVANIA.

In the pegmatite cutting the granite gneiss of the Leiper Quarry at Avondale, Delaware County, Pennsylvania, an occurrence of the mineral axinite has been discovered, certain features of which are so unusual that it has seemed worth while to make it the subject of special study and description. It was in fact at first supposed to be a new mineral, and its true character was only recognized toward the end of the investigation.

Specimen 1 (U.S.N.M. Cat. No. 87232) consists of three small fragments, showing a columnar mineral with a resinous luster, of a pale yellow to salmon pink color, associated with pink microcline, granular quartz, and muscovite. It was found at the locality in 1904, and analyzed by the writer when beginning the study of quantitative analysis. The results, given in column 1*a* in the table below, showed it to have a composition distinctly different from that of any previously known mineral, although, because of lack of experience, it is probable that they are not altogether accurate, some silica having no doubt been weighed with the sesquioxides, and some manganese with the calcium or magnesium; but the boric acid, having been determined by the writer's volumetric method,[1] is probably exact. The matter was then laid aside because of the pressure of other work, but when the writer became connected with the Museum, it was taken up again. To obtain a check on the previous analysis, all the mineral that could still be broken from the specimens, amounting to less than half a gram, was sent to Mr. J. E. Whitfield, of the firm of Booth, Garrett & Blair, of Philadelphia, who has been doing considerable analytical work for the Museum, and his results are given in column 1*b*.

Meanwhile a mass of yellow plates, about 4 by 2 by 1 cm. in size, was found at the quarry by Mr. J. Watts Mercur, jr., of Wallingford, Pennsylvania. (U.S.N.M. Cat. No. 87233). Although showing no planes definite enough for crystallographic measurement, this material had the aspect of axinite, and the same specific gravity, 3.250. A clear fragment was sent to Mr. Whitfield for analyis, and he obtained the results in column 2*a*; but as the boric acid seemed rather low, probably owing to incomplete decomposition, two determinations were made by the writer, and 5.98 and 6.09, average 6.04, obtained (column 2*b*). Using this value, the agreement with the theory for axinite is so close as to leave no doubt that it is the mineral represented.

The question as to whether No. 1 was a new mineral, or only an impure axinite, remained unsolved, so powder from both specimens was submitted to microscopic examination. No. 2 showed a mean index of refraction of 1.680, birefringence 0.008, and sign −, thus agreeing with typical axinite. The greater part of No. 1 gave essentially the same values, but scattered through this material could be seen pinkish, pleochroic grains with a much higher index, 1.700, but still lower birefringence, 0.005, showing, in fact, ultrablue interference colors, also extinguishing straight and + in sign. These properties identified it as zoisite, a mineral which had previously been reported from the locality.[2] Here, then, was the explanation of the difference between analyses 1*a* and 1*b*, as well as their deviation from the theory for axinite: the material is not homogeneous, but contains a variable amount of intergrown zoisite. And the theoretical composition of a mixture of 80 per cent axinite with 20 per cent zoisite, given in the last column, corresponds, in a general way, with the analytical results.

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[1] Journ. Amer. Chem. Soc., vol 30, 1908, p. 1687.

[2] Cardeza, Proc. Acad. Nat. Sci. Phila., 1892, p. 194; discovered by Miss Mary S. Holmes. A small specimen of this mineral, not associated with axinite, collected by the writer about 1906, has also been added to the Museum collection (Cat. No. 87234).

*Table of analyses.*

|  | 1*a* | 1*b* | 2*a* | 2*b* | 3 | 4 |
|---|---|---|---|---|---|---|
| CaO | 22.47 | 20.00 | 19.98 | .......... | 19.66 | 20.48 |
| MnO | 3.26 | 5.19 | 10.12 | .......... | 9.94 | 5.17 |
| FeO | 3.39 | 3.16 | 3.80 | .......... | 2.49 | 5.19 |
| MgO | 2.68 | 1.55 | 1.01 | .......... | .......... | .......... |
| $K_2O$ | 0.65 | n.d. | .......... | .......... | .......... | .......... |
| $H_2O$ | 1.76 | n.d. | 0.57 | .......... | 1.58 | 1.65 |
| $Al_2O_3$ | [22.93] | 22.64 | 18.78 | .......... | 17.91 | 20.54 |
| $B_2O_3$ | 5.45 | n. d. | 3.14 | 6.04 | 6.14 | 5.12 |
| $SiO_2$ | 37.41 | 42.92 | 42.24 | .......... | 42.28 | 41.85 |
|  | 100.00 | (95.46) | 99.64 | .......... | 100.00 | 100.00 |

1*a*. Analysis of a portion of specimen 1, by the writer; MnO and $SiO_2$ probably too low.
1*b*. Analysis of another sample from the same, by Mr. Whitfield.
2*a*. Analysis of axinite, specimen 2, by Mr. Whitfield.
2*b*. Result of determination of boric oxide in the same, by the writer.
3. Theoretical composition of an axinite in which Mn:Fe = 4:1. Compare with 2*a* and 2*b*.
4. Theoretical composition of an axinite in which the Mn:Fe ratio is 1:1, mixed with 20 per cent of zoisite. Compare with 1*a* and 1*b*.

To find zoisite and axinite intimately intergrown is rather unexpected, but unfortunately the material available is too limited to study the relations between them. It looks as if the zoisite had determined the columnar habit, as well as the pinkish color, and so given reason for the original supposition that a new mineral was represented.

# VESPOID AND SPHECOID HYMENOPTERA COLLECTED IN GUATEMALA BY W. P. COCKERELL.

By S. A. ROHWER,

*Of the Bureau of Entomology, United States Department of Agriculture.*

Shortly after Mrs. Cockerell returned from Guatemala in 1912, Prof. T. D. A. Cockerell referred to me, for naming, all the wasps which had been collected; but, due to the fact that very little time could be spent in studying this collection, it was not until recently that all the species have been worked up. The following is a report of every species submitted. As will be seen, a number of them were undescribed, and descriptions of these have been added.

The collection, as here reported upon, has been given to the United States National Museum by Professor Cockerell.

**POLISTES INSTABILIS** Saussure.

Two workers were collected February, 1912, one from Gualan and one from Quirigua, Guatemala.

**NECTARINA LECHEGUANA** (Latreille).

Two workers collected at Amatitlan, Guatemala.

**PARACHARTERGUS APICALIS** (Fabricius).

Two females collected at Guatemala City, Guatemala, and one female collected at Gualan, Guatemala, February 10, 1912.

**PSEUDOCHARTERGUS CHARTERGOIDES** (Gribodo).

One worker collected at Quirigua, Guatemala, on flowers of *Zexmenia virgulata.*

This is the first record of this species north of Panama.

**POLYBIA OCCIDENTALIS** (Olivier).

Five specimens collected at Gualan, Guatemala, and five at Quirigua, Guatemala, one on flowers of *Ipomoea quinquefolia.*

Most of these specimens are rather darker than the typical form, the yellow bands on the abdomen being narrower and the yellow of the metanotum being reduced or in two cases wanting.

**POLYBIA SIMILLIMA** Smith.

Two workers collected at Guatemala City, Guatemala.

Not hitherto recorded from Guatemala.

**STELOPOLYBIA MERIDIONALIS** R. Ihering.

One worker collected at Guatemala City, one at Quirigua, two at Gualan, on flowers of *Verononia aschenborniana,* and one at Amatitlan, Guatemala, February, 1912.

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**STELOPOLYBIA ANGULATA (Fabricius).**

One worker from Antigua, one from Amatitlan, Guatemala.

This species is new to Guatemala.

**STELOPOLYBIA CYANNENSIS (Fabricius).**

Three workers from Antigua, Guatemala.

**EUMENES SANTA-ANNA Saussure.**

One female from Quirigua, Guatemala, on flowers of *Centrosema plumieri*, collected February 11, 1912.

**PACHYODYNERUS NASIDENS (Latreille).**

Two females from Quirigua, Guatemala; one male from Gualan, Guatemala, collected February 16, 1912.

**STENODYNERUS HUASTECUS Saussure.**

Two females from Quirigua, Guatemala, one on flowers of *Zexmenia virgulata*. This differs from description only in having the apical margin of clypeus black.

**STENODYNERUS TOTONACUS Saussure.**

One female from Guatemala City, Guatemala.

**ALASTOROIDES MEXICANUS Saussure.**

One female collected at Quirigua, Guatemala.

**TRICHRYSIS TRIDENS Lepeletier.**

One specimen from Quirigua, Guatemala.

**DASYMUTILLA, species.**

One male from Quirigua, Guatemala.

A small black species which does not seem to be described.

**TIPHIA TRICHIOSOMA Cameron?**

One female from Quirigua, Guatemala; one male from Antigua, Guatemala.

This agrees in most points with the original description of *trichiosoma* Cameron, but there are a few trivial differences, so it is impossible to make the determination certain.

**CAMPSOMERIS DIVES (Provancher).**

Specimen from Gualan, Guatemala, on flowers of *Tithonia diversifolia*.

**CAMPSOMERIS TRIFASCIATA (Fabricius).**

Two males from Antigua, Guatemala.

**CAMPSOMERIS DORSATA (Fabricius).**

Three males from Gualan, Guatemala, one on flowers of *Calopogonium coeruleum* and one on flowers of *Vernonia aschenborniana*, the other without flower record; one male from Quirigua, Guatemala.

**PEPSIS AURANTICORNIS R. Lucas.**

A male and female from Quirigua, Guatemala.

**PEDINASPIS (PEDINASPIS) MARGARETELLA, new species.**

*Male.*—Length, 11 mm. Slender. Clypeus truncate apically, the sides nearly parallel-sided, surface finely granular with one or two large punctures interspread; malar space obsolete; inner margins of the eyes converging to the clypeus, front seen from the side gently rounding upward to the vertex; posterior margin of the head straight, the cheeks broader than the posterior orbits above, rounding posteriorly; ocelli in a low triangle; the postocellar line distinctly shorter than the ocellocular line; lateral ocelli slightly below the supraorbital line, latrad and caudad of each lateral ocellus is a circular fovea; antennae long, filiform, the third joint slightly shorter than the fourth; pronotum very slightly converging anteriorly, angulately emarginate posteriorly; propodeum much elongate, sloping posteriorly, with a median raised line, the surface finely granular; legs very feebly spined; claws with an erect inner tooth; the longer calcarium of the posterior tibia less than half the length of the post-basitarsus; abdomen cylindrical, first segment slightly narrowed anteriorly, subequal in length with the second; third cubital cell slightly longer than the second on the radius, the recurrent veins nearly in the middle of the cells; transverse median of the fore wings its own length beyond the basal vein; transverse median of the hind wings nearly interstitial with the cubitus. Black; a rectangular yellow spot on the lower inner orbits; wings strongly dusky with a faint purplish tinge; venation dark brown basally, pale brown apically; abdomen and propodeum with fine appressed silvery pile.

Guatemala City, Guatemala. Two males collected February, 1912, by W. P. Cockerell.

*Type.*—Cat. No. 15087 U.S.N.M.

The broad cheeks, the flat thorax, especially the propodeum, give this insect a curious appearance and it is likely that a new genus will have to be made for it.

**ARACHNOPHROCTONUS COCKERELLAE, new species.**

This species may be separated from *ferrugineus* (Say) by the clear wings and different relation of the ocelli.

*Male.*—Length, 10.5 mm. Clypeus gently convexed, anterior margin truncate, the lateral margin rounded; inner margin of the eyes slightly emarginate; the distance between them at vertex is less than the distance between them at the clypeus; an impressed line from anterior ocellus to between the bases of the antennae (this line is much stronger as it nears the antennae and is broader just in front of the ocellus); the front between the antennae raised into a convexed mound; postocellar line a trifle shorter than the ocellocular line; antennae longer than the head and thorax, filiform, third and fourth joints subequal in length; posterior margin of the pronotum broadly arcuately emarginate; the dorsal aspect of the propodeum without hair or pubescence; posterior aspect of the propodeum with irregularly scattered black hair; transverse median of fore wings interstitial with the basal vein; second cubital cell subequal in length with the third on the cubitus; third cubital cell strongly narrowed above so its length on the radius is less than the distance between the second recurrent vein and the second transverse cubitus; transverse median of hind wings interstitial; legs feebly spined; all claws cleft. Rufo-ferruginous; flagellum, sutures of the mesothorax, mesosternum, propodeum dorsally, apical margins of the first and second tergites and the base of the first tergite black; wings hyaline, extreme tip dusky; venation strong, black.

Gualan, Guatemala. One male collected February 12, 1912, W. P. Cockerell.

*Type.*—Cat. No. 16028, U.S.N.M.

**EPISYRON PORUS (Fox).**

One specimen from Quirigua, Guatemala.

**STIZUS GODMANI Cameron.**

Male and female from Quirigua, Guatemala; two males and one female from Gualan, Guatemala, on flowers of *Iresine paniculata*.

**MICROBEMBEX TARSALIS, new species.**

This species falls in Handlirsch's table nearest to *monodonta*, but is not *monodonta* or any other subspecies which has been described under this head.

*Female.*—Length, 12 mm. Labrum sharply tapering to a narrow, truncate apex; clypeus strongly convex medianly; the inner margins of the eyes slightly converging towards the clypeus; head finely granular with a few punctures interspread, vertex depressed laterally; third antennal joint distinctly longer than the fourth; mesoscutum shining, with distinct, fine, separated punctures; scutum similarly punctured; propodeum finely granular; tarsal comb well defined; second and third tarsal joints, reduced beneath into strong tubercule; abdomen shining, under high magnification, punctato-reticulate. Black; anterior margin of the clypeus, sides of the labrum posterior margin of the pronotum, tubercules, tegulae, spot above, spot on the sides of the scutellum, metanotum, transverse spot on the dorsal apex of the propodeum; apical bands on the first, second, third, fourth, and fifth tergites, *yellow* or *yellowish white;* legs black; apices of the femora, bases of the tibiae yellow; tarsi ferruginous; wings hyaline; venation pale brown, costa and stigma dark brown.

*Male.*—Length, 12 mm. This agrees well with the above description of the female in its general structure and in color markings except that the colors are greenish yellow; the mesoscutum has two median yellow dots; the bands on the tergite are broader, that on the first indentate medianly, that on the second, third, and fourth slightly produced medianly; the tooth on the second sternite low, with a short hook posteriorly; apical sternite sharply triangular in outline.

Quirigua, Guatemala, and Gualan, Guatemala. Described from one female, type, collected at flowers of *Ipomoea sidaefolia,* February 20, 1912; and one male, allotype, collected at Gualan, February 16, 1912, by W. P. Cockerell.

*Type.*—Cat. No. 16027, U.S.N.M.

**STICTIA GUATEMALENSIS, new species.**

This species runs in Handlirsch's table to *grandis* Handlirsch, from which it may be readily separated, as the following description will show:

*Female.*—Length, 13 mm. Labrum gradually narrowing to the truncate apex; clypeus with a strong median carina, the anterior margin truncate; third antennal joint a little shorter than the fourth and fifth; anterior ocellus in a pit; thorax closely, finely granular; anterior tarsi flattened, the basal joint longer than the three following; femora simple; legs feebly spined; empodia large, well defined; abdomen shining, under high magnification finely reticulate; apical tergite studded basally with a number of strong spines. Black; clypeus, labrum, supraclypeal area, antennal foveæ, inner margins of the eyes almost to the vertex, a U-shaped spot inclosing the ocelli, a line on the posterior orbits broader beneath, posterior margin of the pronotum, tubercule, ventral margin of the pronotum, a broad band from beneath tegulæ to the anterior margin of the mesepisternum, a band from the median coxae to the above-mentioned band, the mesepimeron below, spot on the sides of the propodeum, two marks on the scutum, and a transverse mark on the scutum in front of the scutellum, two spots on the sides of the scutellum, metanotum, posterior margin of the propodeum, an elongate, longitudinal, lateral spot on the first tergite, two median subcircular spots on the same tergite, bands on the second, third, fourth, and fifth tergites which are subinterrupted medianly and with sublateral prong which projects anteriorly to the basal margin of the tergite, sides of the last tergite, and all the sternites, *yellow* or *yellowish white;* legs yellow, the femora above with a black line, and a black spot on the posterior margin of the four anterior tibiæ, the four posterior femora except where mentioned are rufoferruginous; scape and first flagellar joint yellow beneath, the second and following joints of the flagellum ferruginous beneath; wings hyaline; venation brown.

Antigua, Guatemala, and Guatemala City, Guatemala. Described from two females, the type from Antigua, both collected by W. P. Cockerell.

*Type.*—Cat. No. 16026, U.S.N.M.

**SILAON IRESINIDES, new species.**

Belongs to the group *chilensis* and is related to *mexicanus* Rohwer, but may be separated from *mexicanus* by the tridentate clypeal lobe.

*Male.*—Length, 6 mm. Clypeus strongly carinate, median anterior lobe strongly tridentate; head coarsely, closely granular; postocellar line one-third longer than the ocellocular line; flagellum thickening apically, the first joint slightly longer than the second, the apical joint acuminate and slightly longer than the dorsal length of the two preceding joints; mesoscutum shining, studded with close, well-defined, medium sized punctures; mesepisternum coarsely granular; scutellum granular; dorsal aspect of the propodeum with irregular radiating striae; sides of the propodeum with fine striae; posterior aspect with irregular, transverse striae; tergites shining, with sparse, well-defined punctures; the apical margin depressed about one-third, the depression broader medianly; apical tergite more coarsely punctured than the preceding ones; apical sternite broadly rounded to a minutely emarginate apex. Black; pronotum, tubercule, tegulae, metanotum, apices of the four anterior femora (broader beneath), the four anterior tibiae, the apices of the tarsi beneath, extreme apex of the posterior femora, and the narrow line on the posterior tibiae and most of the posterior tarsi *yellowish*; flagellum at about the middle brownish; face, thorax, and depressed area on the tergites with appressed golden pile; wings dusky hyaline, the bases slightly darker; venation pale brown, costa and stigma dark brown.

Gualan, Guatemala. Described from one male collected on flowers of *Iresine paniculata*, by W. P. Cockerell.

*Type.*—Cat. No. 16025, U.S.N.M.

**TACHYSPHEX COCKERELLAE, new species.**

This species is quite distinct by the dentation on the clypeus and the puncturation.

*Male.*—Length, 8 mm. Anterior margin of the clypeus produced in the middle, production sharply angled and with a median tooth, surface of the clypeus finely punctured laterally, with large separate punctures medianly; above each antenna is a faint carina which extends dorsally for a short distance and then curves laterally until it is tangent with a line drawn from the antennal foveae and touching inner orbits of the eye at the vertex; head with close distinct punctures; frontal median line present; intraocellar area divided by a broad furrow; distance between the eyes at the vertex slightly shorter than the length of the third and fourth antennal joints; a Y-shaped depression behind the lateral ocelli; vertex more sparsely punctured than the front; antennae rather short, third joint distinctly shorter than the fourth; mesonotum sculptured like the front; scutellum more sparsely punctured than the mesonotum; dorsal aspect of the propodeum rather coarsely punctato-reticulate, posterior aspect of the propodeum perpendicular but not sharply separated from the dorsal aspect, finely, transversely striato-punctate; longer calcarium of the posterior tibiae about three-fourths the length of the hind basitarsus; abdomen shiny; the apical margin of the first three tergites depressed more than one-third the length of the segment; apical ventral segment deeply, arcuately emarginate, the lobes narrow, pointed at the apex. Black; abdomen rufous; the apical three joints of the hind tarsi piceous; head and thorax densely clothed with gray pubescence; wings dusky hyaline; costa and stigma dark brown; venation pale brown.

Amatitlan, Guatemala. Described from two males collected by W. P. Cockerell, February, 1912. Type collected February 5, paratype, without definite date.

*Type.*—Cat. No. 15086, U.S.N.M.

**NOTOGONIDEA STERNALIS, new species.**

Of the described species this species comes nearest to *beata* Cameron, but may be separated from that species by having the scape distinctly longer than the second and third joints.

*Male.*—Length, 7 mm. Clypeus carinate medianly, the median portion produced into a broad, low lobe; frontal ridges strong; third antennal joint slightly shorter than the fourth; eyes separated at the vertex by a distance slightly longer than the length of the second and third antennal joints; depression behind the ocelli not sharply defined; head very finely granular, opaque; thorax finely granular, opaque; propodeum slightly more coarsely granular; the dorsal and posterior surfaces separated by a sharp carina which is emarginate medianly; the posterior face without striae; legs feebly spined, the longer calcarium of the posterior tibiae subequal in length with the basitarsis; second, third, and fourth sternites with coarse, reddish hair near the middle; this hair is denser on the third sternite; apical sternite broad, nearly truncate, lateral angles rounded and in the middle very slightly emarginate; third cubital cell slightly longer than the second on the radius. Black; covered with a fine gray pile which on abdominal segments takes the form of apical bands, and is denser on the posterior aspect of the propodeum, and the face below the crest; wings hyaline, with a strong purplish tinge, apices dusky; venation pale brown except the costa and stigma which are black.

Gualan, Guatemala. Described from one male collected February 15, 1912, by W. P. Cockerell.

*Type.*—Cat. No. 16023, U.S.N.M.

**NYSSON (BRACHYSTEGUS) GUATEMALENSIS, new species.**

Differs from *Nysson zapotecus* Cresson, as described by him, in the color of the legs.

*Female.*—Length, 7 mm. Anterior margin of the clypeus gently rounded, surface obscured with dense pubescence; frontal carina short, extending about half the distance from the bases of the antennae to the anterior ocellus; head finely granular with large, distinct, separate punctures interspread; anterior ocellus larger than lateral ocelli; inside of each lateral ocellus is a raised tubercule; postocellar line slightly longer than the ocellocular line; antennæ thickened apically, the third joint slightly longer than the fourth; lateral anterior margin of the pronotum dentate; mesonotum bipunctate, surface with very small, distinct punctures, the large punctures are separate and distinct; the large punctures on the scutellum are confluent; mesepisternum coarsely reticulate; dorsal aspect of the propodeum with oblique longitudinal carinae, posterior face with the usual V-shaped fovea; abdomen opaque with a number of large separate punctures; legs of the normal type; pygidium about one and one-third times as long as the basal width, gradually narrowed to a subtruncate apex; third cubital cell on the radius but little shorter than the distance between the second transverse cubitus and the first recurrent vein. Black; margin of the pronotum, tubercule, a line on the anterior portion of the scutellum, narrowed apically bands on the first to the fourth segments, interrupted on the second and fifth, *yellowish white*; legs black, the four anterior femora beneath and the posterior femora entirely rufous; head and thorax with dense, appressed, silvery pile; wings dusky hyaline, iridescent; venation dark brown.

Amatitlan, Guatemala. Described from one female collected by W. P. Cockerell, February, 1912.

*Type.*—Cat. No. 15083, U.S.N.M.

**NOTOGLOSSA PYRURA, new species.**

Judging from the descriptions this species is closely allied to *argenteopilosus* Cameron but may be easily separated from it by the squamae which have the inner posterior margin lobate with the lobe extending posteriorly beyond the curved spine.

*Female.*—Length, 4 mm. Anterior margin of the clypeus truncate in the middle, biemarginate laterally so there is a lateral, triangularly-shaped tooth; clypeus sparsely punctured; the interantennal line slightly shorter than the antennocular line; head subshiny with well separated, distinct, medium sized punctures; ocelli in a low triangle; the ocellocular line distinctly shorter than the interocellar line; inner orbits slightly depressed and more sparsely punctured than the rest of the head; antennae short, the third antennal joint slightly longer than the fourth; anterior margin of the pronotum sharply carinate, interrupted in the middle, laterally subdentate; mesonotum sculptured like the head; mesepisternum shiny, punctate above, striato-punctate below; squamae and spines about as in *argenteopilosus* Cameron [1] but differs as mentioned above; dorsal aspect of the propodeum with five oblique carinae; posterior aspect of the propodeum defined laterally by sharp carinae, transversely striato-punctate; the median fovea U-shaped with the carina from its apex to the ventral aspect of the posterior face; anterior femora simple; bases of four posterior tibiae rather coarsely spined, the longer calcarium of the posterior tibiae but little shorter than the post-basitarsis; abdomen shiny with distinct well separated punctures, basal segment depressed in the middle; pygidium broad, the surface rugose, the apex narrowly rounded. Black; mandibles, apex of scape, pronotum, tubercules, two spots on

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[1] Figured on pl. 9, fig. 23*a*, Biol. Centr.-Amer., vol. 2, Hym.

the scutellum, narrow lateral spots on the first to fourth tergites, the apices of the four anterior femora beneath, the four anterior tibiae except a line above, basal spot on the posterior tibiae externally, *yellow*; tegula piceous; sqamae, spines, and calcaria pallid; flagellum beneath, the three apical joints above and the anterior tarsi fuscous; wings hyaline, faintly dusky, strongly iridescent; venation dark brown; apical abdominal segment bright red.

*Male.*—Length, 3.5 mm. A single specimen which for the time being may be considered as the male of the species, differs from the female as described above in the following characters: The fovea of the posterior face of the propodeum V-shaped, the apex of the V being almost at the ventral margin of the posterior aspect of the propodeum; pronotum, tubercules and scutellum black; the four anterior tibiae and tarsi, the base of the posterior tibiae and the posterior tarsi yellow (the tarsi are rather paler). The apical dorsal segment of the abdomen angularly notched, the lobes triangular in outline.

The spots on the second, third, and fourth tergites may be wanting or incomplete.

Quirigua, Guatemala. Described from three females and one male collected by W. P. Cockerell, February, 1912, bearing the following note, "nesting in sand."

*Type.*—Cat. No. 15085, U.S.N.M.

**RHOPALUM OPACUM, new species.**

Differs from *Rhopalum spinigerus* Cameron by the absence of the spines on the anterior femora and other characters, nor will it agree with the description of *Rhopalum angulicolle* Cameron, being easily distinguished from this species by the pale four anterior femora.

*Male.*—Length, 4 mm. Anterior margin of the clypeus regularly rounded, without teeth; distance between the eyes at the clypeus subequal with the length of the second and third antennal joints; head finely granular; an impressed line from the anterior ocellus to between the bases of the antennae; ocelli in an equilateral triangle; postocellar line distinctly shorter than the ocellocular line; third antennal joint much shorter than the fourth; pronotum long, rounded anteriorly, neither dentate nor carinate; thorax opaque, finely granular; the suture between the metanotum and the propodeum strongly foveolate; propodeum finely granular; the four anterior legs normal, the posterior tibiae strongly curved beyond the basal fourth, posterior basitarsis curved basally, subequal in length with the two following joints; petiole not strongly nodose, not as long as the two following segments combined; first recurrent vein slightly beyond the middle of the first cubital cell; first transverse cubitus straight, not oblique. Black; mandibles, palpi, scape, flagellum beneath, tubercules, the apical lateral margin of the third tergite, the anterior legs, intermediate trochanters, femora and tibiae beneath and spot on the posterior trochanters *yellowish*; intermediate tarsi and basal fourth of posterior tibiae pallid; wings hyaline, very slightly dusky, strongly iridescent; venation dark brown.

Quirigua, Guatemala. Described from one male collected by W. P. Cockerell, February, 1912.

*Type.*—Cat. No. 15084, U.S.N.M.

**TRYPOXYLON AZTECUM Saussure.**

One female from Quirigua, Guatemala.

**TRYPOXYLON MEXICANUM Saussure.**

One female from Quirigua, Guatemala, February, 1912.

Prof. T. D. A. Cockerell has described this specimen as follows:

"Length about 20 mm.; anterior wing about 12; shining black, the front dull and rugose; clypeus longitudinally carinate, its lower lateral corners angled; sides of face, and inferior orbits behind, with shining silvery hair; mandibles ferruginous; antennae entirely black; emargination of eyes very deep; mesothorax with very fine punctures, scutellum almost impunctate on disk; hair of front, vertex, occiput and thorax short, scanty, and black; metathorax smooth and shining, with very feeble minute punctures, and a slight median groove, but the posterior part finely obliquely striate; tegulae shining black; wings dark fuliginous, with a purple iridescence; basal nervure falling short of transverse medial; stigma very small; marginal cell long, pointed at apex, angled beneath near middle; only two submarginal cells, the first extremely long, receiving first recurrent nervure some distance from end; second about half as large as first, about half as wide above as below, receiving second recurrent nervure about one-fourth of its length from base; outer angle formed by second recurrent on joining second submarginal cell an acute angle; outer nervures of third discoidal and second submarginal cell evanescent; legs black, with the apical half of hind basitarsi, and the three following joints silver-white, with a creamy tint in some lights; last joint of hind tarsi with the base pale reddish, the apical part dark; hind spur bent; abdomen petiolate, elongate, smooth and shining, about 3 mm. wide in middle; a depression between first and second segments dorsally; no pygidial area; apical segment carinate; last ventral segment with fine light brownish tomentum and long erect hairs."

**TRACHYPUS MEXICANUS (Cameron).**

Specimen from Quirigua, Guatemala, collected February 15, 1912, on *Pontederia cordata*.

**CERCERIS IRESINIDES, new species.**

This species does not agree with any of the species described by Cameron, and as it is a male its affinities can not be easily ascertained.

*Male.*—Length, 6 mm. Clypeus flat, the anterior margin tricrenulate, the lateral margin with strong tuft of hair; supraclypeal tubercule poorly defined; postocellar line shorter by the width of the lateral ocellus than the ocellocular line; pedicellum globose; third antennal joint about one-fifth longer than the fourth; head closely, sometimes confluently punctured; mesonotum with distinct, well-defined, large punctures; mesepisternum with the punctures less distinct and closer than those on the scutum; propodeal inclosure smooth, impunctate, divided by a median furrow; the rest of the propodeum punctured similar to the scutum but more sparsely so; first tergite sparsely punctured with large, deep, well-defined punctures; pygidium slightly narrowing apically, elongate oval in outline, apex subtruncate. Black; clypeus, sides of face up to the top of the antennal foveae, scape beneath, two spots on the pronotum, line on the scutellum, line on the metanotum, the four anterior tibiae and tarsi, the basal third of the posterior tibiae, two-thirds of the posterior basitarsis, bands on the first, second, fourth, fifth, and sixth tergites, and lateral spots on the third tergite, *yellow;* the bands on the first and second tergites are much wider than those on the following tergites; head and thorax with gray hair; wings subhyaline, the area beyond the basal vein and above the cubitus dusky; venation including stigma dark brown; flagellum orange colored beneath.

Gualan, and Guatemala City, Guatemala. Described from two females from the first mentioned locality, one of which was collected at the flowers of *Iresine paniculata* and is chosen as the type; the other was collected February 18, 1912; and one male from the latter mentioned locality, all collected by W. P. Cockerell.

*Type.*—Cat. No. 16024, U.S.N.M.

# REPORT ON ROTATORIA FROM PANAMA WITH DESCRIPTIONS OF NEW SPECIES.

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## INTRODUCTION.

This report is based on a large number of collections made by Dr. C. Dwight Marsh during the months of January and February, 1912. That no complete picture can be given of the rotatorian fauna of the Isthmus of Panama is self-evident, as all the collections were made during the dry season and but very little material was narcotized, so that the contractile forms were with few exceptions unrecognizable. However, the loricate species were abundant and furnished interesting material. The Isthmus is not a specially favorable collecting ground for aquatic invertebrates, as there are no lakes and but few permanent pools; nevertheless it will be seen from the list of Rotatoria that when suitable conditions are present the fauna is both abundant and varied.

The following extract from Marsh [1] will give some idea of the environment:

> The continental divide is close to the southern shore of the Isthmus. From the summit of the divide to high tide on the Pacific side is only about 6 miles. The slope consequently is very steep and whatever water falls runs away almost immediately. During the season when the collections were made there was practically no rain on this slope, so that it was difficult to find any fresh water. Consequently nearly all the collections on the southern slope within the limits of the Canal Zone were made either in water which had been artificially impounded or in the standing water in the deeper parts of streams that were otherwise dry.
>
> The northern slope extends from the divide to the Atlantic, a distance, in a straight line, of something over 30 miles. Two considerable rivers come into the Canal Zone from this slope, the Rio Chagres and Rio Trinidad. On the lower reaches of these rivers, and this is especially true of the Trinidad, are extensive swamps. The Chagres is a swift-flowing stream, sometimes torrential in character, and does not furnish a suitable environment for any extensive development of plankton organisms. The swamps form a suitable environment for plankton, but, connected together as they are, would not lead one to expect any great variety.
>
> Gatun Lake will eventually be a large body of water with a surface of 164 square miles and a depth of 47 feet. At the time the collections were made the lake was very

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[1] Marsh, C. Dwight, Report on fresh-water Copepoda from Panama with descriptions of new species. Smiths. Misc. Coll., vol. 61, No. 3, 1913.

small. Especially careful collections were made in this lake and in the neighboring waters and in sufficient numbers to give a good idea of its flora and fauna.

There are no natural lakes in the Canal Zone; the Canal Commission, however, has built for sanitary purposes a series of reservoirs and these, having been in existence for a considerable period, may be considered as lakes. Only the following three yielded Rotatoria in any considerable number: Rio Grande, built in 1906, elevation 240 feet, depth 50 feet; Camacho, built in 1907, elevation 370 feet, depth 45 feet; and Carabali or Gorgona, built in 1906, elevation 76 feet, depth 10 feet. While the Rio Grande is considered as constructed in 1906, it is really an old French reservoir which was built some time between 1882 and 1889 and has had a continuous existence since that time; it covers an area of 72.77 acres.

These reservoirs were made by constructing dams in places where the waters of small streams could be impounded. The beds were cleared and after construction the shores were kept clear of vegetation to a distance of 50 or more feet from the margin. The reservoirs were all "plankton-poor." This is what would be expected from the environment, which produces permanent bottom stagnation. In cold climates the bottom waters of lakes have a more or less complete stagnation in the summer and in winter, the stagnation being more complete in the smaller bodies of water in which winds have no opportunity to produce bottom currents, but in spring and in fall, because of the change in temperature, there is a complete overturning of the water. No such change, of course, takes place under the constant temperature conditions of the Canal Zone, so that only the surface water contains the oxygen which is necessary for the life of plankton organisms. While the foregoing statement is true in regard to the general conditions of the waters of the reservoirs, it must not be understood as meaning literally that the oxygen content always diminishes in exact ratio to the depth; local and meteorological causes may produce some modifications of the general statement. This has been discussed by Downes, who gives a series of charts of dissolved oxygen.[1]

For preserving the collections two different mixtures of alcohol and formalin solution were used by Doctor Marsh, one of equal parts of 50 per cent alcohol and 5 per cent formalin, another of equal parts of 75 per cent alcohol and 5 per cent formalin. In the matter of producing recognizable material of the illoricate species of Rotatoria they are on the same footing; only narcotizing will do that. But an alcoholic mixture is far better for the subsequent sorting out of the material, which necessarily contains a certain amount of plant débris; if a straight formalin solution is used, this débris sticks to the animals so that it is almost impossible to clean them. An alcoholic preservative, on the contrary, leaves everything free and it is a comparatively simple matter to pick out the animals. The strength of the alcohol does not appear to be very important; probably 75 per cent alcohol is as good as any.

To facilitate reference the localities yielding large collections of Rotatoria are numbered as below and the number added in parenthesis after the record of each species.

1. From the railroad bridge over water in Black Swamp; now submerged in Gatun Lake.

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[1] Downes, J. R., A study of the water supplies of the Isthmus of Panama. Proc. Canal Zone Med. Ass., Mount Hope, C. Z., vol. 3, pp. 133-150, 7 pls.

2 Pool covered with algae, near the railroad, between Black Swamp and Gatun; now submerged in Gatun Lake.

3. Creek flowing into Camacho Reservoir; clogged with weeds covered with Nostoc, etc.

4. Stagnant pool at the end of Canal cut, Empire. At the time the collections were made it was nearly dry and green with algae; when filled the pool is probably 5 or 6 feet deep.

5. Rio Grande Reservoir, near the railroad bridge.

6. Rio Grande, collections from the river.

7. Pond west of Rio Chagres at Bohio. Formed by a dam built by the French. Water lilies along shore; the collections were made in the middle, where the water was clear.

8. Pond east of the Canal, east of Empire. About 2 acres in area; surrounded by grass growing out from the shore in such masses that it will nearly support the weight of a man.

9. Rio Trinidad, below Agua Clara, about 1 mile from mouth; now part of Gatun Lake.

10. Rio Trinidad, just above Agua Clara; now part of Gatun Lake.

11. Rio Trinidad, opposite Escoval, in weeds along shore; now part of Gatun Lake.

12. Pond north of fill work at Miraflores; really back water of Rio Camitillo.

## LIST OF THE SPECIES COLLECTED.

### NOTOMMATA AURITA (Müller).

A single recognizable specimen in a collection from a pond north of the fill work at Miraflores, formed by back water of Rio Camitillo (2).

### NOTOMMATA CERBERUS (Gosse).

Several specimens, of which one was fully extended, occurred in a creek flowing into Camacho Reservoir (3).

### NOTOMMATA COPEUS Ehrenberg.

Common in a slow stream in garden of Isthmian Canal Commission, Empire; also in a collection from the railroad bridge over Black Swamp (1).

### NOTOMMATA PSEUDOCERBERUS de Beauchamp.

A single specimen from a pool near the railroad, between Black Swamp and Gatun (2); another from Rio Trinidad, collected just above Agua Clara (10).

### NOTOMMATA TORULOSA (Dujardin).

One specimen, identified by the trophi, from a stagnant pool by the railroad, north of bridge over Black Swamp.

### PLEUROTROCHA SORDIDA (Gosse).

*Proales sordida* GOSSE, Hudson and Gosse, Rotifera, 1886, vol. 2, p. 37, pl. 18, fig. 7.

A single specimen, with some doubt referred to this species, from a pool near the railroad, between Black Swamp and Gatun (2).

### DIASCHIZA AURICULATA (Müller).

*Diaschiza lacinulata* LEVANDER, Acta Soc. Flora Fauna Fennica, vol. 12, No. 3, 1894, p. 43.

A few specimens from Rio Trinidad, just above Agua Clara (10).

### DIASCHIZA FORFICATA (Ehrenberg).

*Diaschiza caeca* DIXON-NUTTALL and FREEMAN, Journ. Royal Micr. Soc., 1903, p. 134, pl. 4, fig. 11.

A few specimens from each of the following localities: Creek flowing into Camacho Reservoir (3); Rio Trinidad, in weeds along shore at Agua Clara (10) and Escoval (11).

### DIASCHIZA GIBBA (Ehrenberg).

In creek flowing into Camacho Reservoir (3); not abundant.

### DIASCHIZA GRACILIS (Ehrenberg).

A few specimens in the same collection as *Diaschiza gibba* (3).

### MONOMMATA ORBIS (Müller).

*Monommata longiseta* BARTSCH, Jahresh. Naturk. Württemberg, vol. 26, 1870, p. 344.

A few specimens from a pool near the railroad, between Black Swamp and Gatun (2); also from creek flowing into Camacho Reservoir (3) and in Rio Trinidad, at Escoval (11).

### DICRANOPHORUS FORCIPATUS (Müller).

*Diglena forcipata* EHRENBERG, Abh. Akad. Wiss., Berlin (for 1831), 1832, pp. 137, 154, pl. 4, fig. 10.

? *Diglena grandis* EHRENBERG, Abh. Akad. Wiss., Berlin (for 1831), 1832, p. 137.

Typical specimens of this species occurred in the following localities: Slow stream in garden of Isthmian Canal Commission, Empire; pool between Black Swamp and Gatun (2); creek flowing into Camacho Reservoir (3); stagnant pool at Empire (4); Rio Grande Reservoir (5); Rio Grande, river (6). Specimens with straight toes, about 55 $\mu$ long, agreeing with published figures of *D. grandis*, were found in Rio Trinidad (9) and a stream in garden of Isthmian Canal Commission, Empire. As far as could be determined from the partly contracted specimens, they agreed with a single specimen collected near Boston and sent me for comparison by Mr. Rousselet, who informs me that he has always considered *D. grandis* a synonym of *D. forcipatus*. The trophi of the Panama specimens are identical with those of typical specimens of *D. forcipatus*.

### ENCENTRUM FELIS (Müller).

*Vorticella felis* MÜLLER, Verm. Terr. Fluv., vol. 1, pt. 1, 1773, p. 108.
*Diglena felis* BILFINGER, Jahresh. Naturk. Württemberg, vol. 50, 1894, p. 46.

Common in a stagnant pool, Empire (4). While the specimens were partly contracted, the trophi make the determination reasonably certain.

### BRACHIONUS ANGULARIS CAUDATUS Barrois and Daday.

From the following localities: Stagnant stream under old bridge, Old Panama (probably Rio Alcorobo), common; Gatun Lake, enormous numbers; pond at Bohio (7), very abundant; Carabali (Gorgona) Reservoir, common; Bayou of French Canal, about 2 miles south of Gatun, common; pond at Miraflores (12), common.

### BRACHIONUS BUDAPESTINENSIS Daday.

Specimens agreeing with material collected here at Washington were common in Carabali (Gorgona) Reservoir.

### BRACHIONUS CAPSULIFLORUS Pallas.

The form with posterior spines (*B. bakeri* Müller) is common on the Isthmus; the strongly asymmetric foot tube is abnormally developed, the left spine being sometimes as long as the posterolateral spines; the median anterior spines are also longer than usual. This form occurs in the following collections: Stagnant stream under old bridge, Old Panama, common; Gatun Lake, enormous numbers; Mindi Reservoir, few; Rio Grande Reservoir (5), few; Rio Grande (6), few; pond at Miraflores (Rio Camitillo) (12), common.

The spineless form (*B. urceolaris* Müller) occurred in great abundance in a sluggish stream partly filled with grass, in the savannas between Panama and Old Panama.

### BRACHIONUS DOLABRATUS, new species.

Plate 16, figs. 1–2.

While showing a certain resemblance to *B. angularis* Gosse, this species has a number of peculiarities that entitle it to specific rank. At the junction of the dorsal and ventral plates of the lorica there are two blunt lateral spines or knobs and a similar pair at the posterolateral angles. They are always slightly asymmetric and very variable; the form figured may be considered an average one. On each side of the foot opening is a hammer-shaped spine, frequently with small posterior spicules or setae; it is possible that they are always present in the living animal, and that they may have been destroyed by the preservative. The egg is carried by the parent and always rests upon the dorsal points of the foot spines, as shown in the lateral view. The anterior edge of the dorsal plate is strongly convex and has a single pair of spines at the side of the antennal sinus; the ventral edge has a wide and shallow median notch. Both dorsal and ventral plate is moderately convex. The lateral antennae are unusually stout and project through simple holes in the dorsal plate, very close to the edge of the lorica.

Total length of lorica, 105 $\mu$; width over lateral spines, 100 $\mu$; width of anterior edge, 60 $\mu$; depth of body, 42 $\mu$.

*Type.*—Cat. No. 16570, U.S.N.M., from a pond west of Rio Chagres, at Bohio, where the species is common.

### BRACHIONUS FALCATUS Zacharias.

This excessively variable species occurs on the Isthmus in an almost infinite variety of forms. It is recorded from the following localities: Stagnant stream under old bridge, Old Panama, abundant; Gatun Lake, enormous numbers; Mindi Reservoir, few; bayou of French Canal, 2 miles south of Gatun, common.

### BRACHIONUS PATULUS Müller.

*Brachionus militaris* EHRENBERG, Abh. Akad. Wiss., Berlin (for 1833), 1834, p. 199.

A very small, but otherwise normal form occurs occasionally on the Isthmus: Stagnant stream under old bridge, Old Panama, few; stagnant pool at Empire (4), common; back water of Rio Chagres at Las Bocas del Gatun, few.

### BRACHIONUS PATULUS MACRACANTHUS (Daday).

Plate 17, fig. 1.

*Noteus militaris macracanthus* DADAY, Zoologica, Heft 44, 1905, p. 119, pl. 7, figs. 3–5.

This form is common in weedy ponds everywhere in the Canal Zone. A peculiarity in the position of the lateral antennae deserves notice; in the typical, short-spined form the antennae are on the inner edge of the lateral spines, as figured by Cohn, while in *macracanthus* they are on the spines, about one-third the length of the spine from the posterior end, where there is a decided "knee." In Daday's figure a projecting knob is shown, which is no doubt the antenna, or rather, it is in the position of the antenna. The form *macracanthus* was found in collections from: Stagnant stream under old bridge, Old Panama (probably Rio Alcorobo), common; slough in savannas near police station on road to Old Panama, common; Gatun Lake, abundant; creek flowing into Camacho Reservoir (3), common; Rio Cocoli, above reservoir, few; stagnant pool at Empire (4), abundant; Rio Grande (6), few; pond at Bohio (7), few; pond at Miraflores (12), common.

### BRACHIONUS MIRABILIS Daday.

A single specimen in a collection from the railroad bridge over water in Black Swamp (1).

### PLATYIAS QUADRICORNIS (Ehrenberg).

*Noteus quadricornis* EHRENBERG, Abh. Akad. Wiss. Berlin (for 1831), 1832, p. 143.

The Isthmian form of this species has very long toes; the average measurements of a considerable number of specimens from Washington are: Length of lorica without anterior or posterior spines 225 $\mu$, toes 37 $\mu$; from Panama, lorica 217 $\mu$, toes 60 $\mu$. In words, the toes in the latter form are relatively nearly twice as long as in the local form. There are no other important differences; the lorica in the Panama specimens is less irregular in outline, almost circular; the posterior spines are similar, possibly a trifle longer, and the points are identical; the spines are very slightly blunted at the extremity and end in a short, very fine and needlelike point. The species was found in the following collections: From railroad bridge over water in Black Swamp (1), common; pool near railroad, between Black Swamp and Gatun (2), few; pond at Miraflores (12), few.

### KERATELLA STIPITATA (Ehrenberg).

*Anuraea stipitata* EHRENBERG, Infusionsth., 1838, p. 507, pl. 62, fig. 11.

As this species is common here at Washington, the Panama material was gone over carefully in order to determine the distribution of the two closely related species *K. stipitata* and *K. cochlearis*. All the Isthmian specimens belong to *K. stipitata; K. cochlearis* was not found at all. The latter has been repeatedly recorded from South America; it would be interesting to know whether it is really found there or whether the not very conspicuous difference in the dorsal pattern has been overlooked. The distribution of the two species in North and South America is still an unsolved problem; personal observations indicate that Washington is on the border line of the respective territories, but the evidence is too fragmentary to warrant any definite conclusion. With all due respect to Doctor Zelinka, the re(?)discoverer of this species, the writer believes, until confronted with the "corpus delicti" from the neighborhood of Berlin, that Lauterborn was correct in his opinion, that Ehrenberg drew the *quadrata* (=*aculeata*)—tesselation in the *cochlearis*—outline. This is not inexplicable, as Ehrenberg does not record *K. cochlearis* at all. Now, it is well known, through the work of later investigators, that this species is to be found nearly everywhere in Germany, and the supposition is not unreasonable that Ehrenberg, finding a *Keratella* (=*Anuræa*) with a median spine and a dorsal tesselation of some sort, concluded without any careful examination that it was the, to him, familiar *quadrata* pattern. In favor of this assumption is the fact that in a later paper[1] Ehrenberg figures under the name *stipitata* what is evidently a typical *cochlearis*.

*Keratella stipitata* was found in collections from: Gatun Lake, abundant; Brazos Brook Reservoir, collected in the middle, abundant; creek flowing into Camacho Reservoir (3), few; Camacho Reservoir, common; stagnant pool at Empire (4), few; Rio Grande (6), few; pond at Bohio (7), very abundant; Rio Grande Reservoir (5), common; pond at Miraflores (12), common; the form without posterior spine (*tecta*) in a bayou of the French Canal, 2 miles south of Gatun, few.

### KERATELLA QUADRATA (Müller).

*Anuraea aculeata* EHRENBERG, Abh. Akad. Wiss., Berlin (for 1831), 1832, p. 145.

In creek flowing into Camacho Reservoir (3), few.

### NOTHOLCA LONGISPINA (Kellicott).

A single specimen from a pond near Rio Chagres at Bohio (7).

### ANURAEOPSIS FISSA (Gosse).

*Anuraea fissa* GOSSE, Ann. Mag. Nat. Hist., ser. 2, vol. 8, 1851, p. 202.

Carabali (Gorgona) Reservoir, common; Rio Grande Reservoir (5), few.

### MYTILINA TRIGONA (Gosse).

*Diplax trigona* GOSSE, Ann. Mag. Nat. Hist., ser. 2, vol. 8, 1851, p. 201.

A single specimen in a collection from the railroad bridge over Black Swamp (1); stagnant pool at Empire (4), abundant.

### MYTILINA VENTRALIS (Ehrenberg).

*Salpina ventralis* EHRENBERG, Abh. Akad. Wiss., Berlin (for 1831), 1832, p. 133, pl. 4, fig. 7.

This species appears to be rare on the Isthmus; only single specimens were found, in the following collections: Pool between Black Swamp and Gatun (2); Rio Grande Reservoir (5); Rio Grande (6); Rio Trinidad, above Agua Clara (10).

### EUCHLANIS DILATATA Ehrenberg.

From a slow stream in garden of Isthmian Canal Commission, Empire, common; stagnant pool by the railroad, north of bridge over Black Swamp, few; pool between Black Swamp and Gatun (2), few; stagnant pool at Empire (4), common; Rio Grande (6), few; Rio Trinidad, at Escoval (11), few; pond at Miraflores (12), common.

### EUCHLANIS OROPHA Gosse.

From a creek flowing into Camacho Reservoir (3), common; Rio Trinidad, at Escoval (11), few.

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[1] Abh. Akad. Wiss., Berlin (for 1841), 1843, pp. 291-446, pls. 1-4.

### EUCHLANIS PLICATA Levander.

While this species is rather common in the collections, all the specimens are partly contracted, so that no satisfactory figure can be given of it. From a pool between Black Swamp and Gatun (2), common; stagnant pool at Empire (4), few; Rio Grande Reservoir (5), common.

### EUCHLANIS TRIQUETRA Ehrenberg.

It is not without hesitation that the Panamanian specimens are listed under this name; the dorsal keel is absent, the two lateral plates simply coming together at an approximately right angle. However, the resemblance to *E. triquetra* is otherwise very close, and considering the present unsatisfactory status of the genus, it seems advisable to refer this form to *triquetra* until the limits of variation in this genus are better known. It occurred in a collection from the railroad bridge over Black Swamp (1), common; Rio Alcorobo, under bridge on road from Panama to Old Panama, few.

### DIPLEUCHLANIS PROPATULA (Gosse).

Isthmian specimens of this species resemble closely the form figured by de Beauchamp from the Lofu River.[1] In collection from railroad bridge over Black Swamp (1), few; creek flowing into Camacho Reservoir (3), few; stagnant pool at Empire (4), common; Rio Grande Reservoir (5), few; Rio Grande (6), few; pond at Miraflores, back water of Rio Camitillo (12), common.

### LECANE CREPIDA, new species.

Plate 22, figs. 4–7.

The body is parallel-sided for one-half of its length and tapers rapidly to the foot; it is strongly gibbous posteriorly and has a very flexible lorica. The anterior dorsal margin is slightly convex, the ventral a trifle concave; the anterior spines are stout and slightly incurved. The dorsal plate is strongly convex and much smaller than the ventral; its limits are rather ill-defined and the markings are limited to two pairs of divergent, wavy ridges, beginning near the anterior margin. The ventral plate is moderately convex and has two broken series of ridges extending the greater part of its length; there is a well-marked transverse fold immediately in front of the foot. As shown in the cross section of the body (fig. 8), there are no lateral sulci; the section of the lorica connecting the dorsal and ventral plates is very slightly concave and marked with three ridges, one posterior, and a pair immediately in front of the lateral antennae, which are just above the edge of the ventral plate. The posterior segment merges without any definite anterior limit with the body; ventrally it has a large, circular opening for the foot.

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[1] Bull. Soc. Zool. France, vol. 38, 1913, p. 184, fig. 2.

The first foot joint is large and bulbous; it is at least possible that this really corresponds to the posterior segment of the body in other species of *Lecane*. The second foot joint is square and unusually long; it projects for nearly its entire length beyond the lorica. The toes are long, slender, and tapering, slightly curved at the base; the claw is nearly one-third the length of the toe, conical and not curved.

Total length, 135 $\mu$; length of lorica, 90 $\mu$; width of anterior points, inner edges, 52 $\mu$; length of dorsal plate, 75 $\mu$, width, 45 $\mu$; width of ventral plate, 60 $\mu$; toe without claw, 30 $\mu$, claw, 9 $\mu$; depth of body, 43 $\mu$.

*Type.*—Cat. No. 16578, U.S.N.M., from a stagnant pool at Empire (4), where the species is common; it occurred also in a pool near the railroad, between Black Swamp and Gatun (2), common; Gatun Lake, among water plants near the railroad bridge, few; creek flowing into Camacho Reservoir (3), abundant; Rio Grande Reservoir (5), abundant; Rio Grande (6), few.

This is no doubt the animal recorded by Jennings[1] and figured under the name *Distyla gissensis* Eckstein, from specimens collected in a swamp near the fish hatchery on South Bass Island in Lake Erie. The original description does not fit *L. crepida* any better than it does any other known *Lecane;* it is doubtful whether Eckstein's species is now identifiable.

*Lecane crepida* has but one close relative, *L.* (= *Cathypna*) *hastata* (Murray); the similarity is not, however, so close that there can be any question of identity. Whether these two species represent a primitive branch of the genus or a highly specialized one is uncertain; that they may have retained more of the ancestral characters than any other known species is not improbable.

### LECANE LUNA (Müller).

*Cathypna luna* GOSSE, Hudson and Gosse, Rotifera, 1886, vol. 2, p. 94, pl. 24, fig. 4.

From a pool near the railroad, between Black Swamp and Gatun (2), common; creek flowing into Camacho Reservoir (3), common; stagnant pool at Empire (4), abundant.

### LECANE PAPUANA (Murray).

*Cathypna papuana* MURRAY, Journ. Royal Micr. Soc., 1913, p. 551, pl. 22, fig. 2.

This species is widely distributed on the Isthmus, but usually in small numbers: Gatun Lake, near railroad bridge, few; stagnant pool at Empire (4), few; Rio Grande Reservoir (5), few; Rio Grande (6), few; bayou of French Canal, about 2 miles south of Gatun, abundant; Rio Trinidad, at Escoval (11), few; pond at Miraflores (12), few.

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[1] Bull. U. S. Fish Comm., vol. 19, 1900, p. 91, pl. 20, figs. 33, 34.

### LECANE SIBINA, new species.

Plate 23, figs. 5–7.

The body is broadly ovate and its thickness more than two-thirds of the width. The anterior margins are very nearly coincident and slightly concave, with two lateral triangular projections, but without true spines. The dorsal plate is very broad and ovate in outline; while without any facetting whatever, it has two deep anterior, diverging folds, the limits of a strongly convex lobe. At the sides of this lobe the dorsal plate is concave, making it possible for the anterior dorsal and ventral margins to meet and close the lorica when the head is retracted. The ventral plate is slightly narrower than the dorsal, oval and without facetting; some inconspicuous transverse folds are present near the posterior end; the anterior margin has a very small median sinus. The lateral sulci are moderately deep and do not reach the anterior margin; they are indicated by dotted lines in figure 7. The posterior segment of the body is very large and prominent, projecting quite a distance over the toes; it is noticeably emarginate at the outer angles of the coxal plates, which are large and obtusely triangular. The first foot joint is minute, the second short and broad. The toes are in dorsal view nearly parallel-sided, a trifle narrowed immediately beyond the base and widest at the beginning of the posterior third, where there are some obscure annular constrictions. The claw is half the length of the toe, unusually slender, conical, and very slightly decurved. At its base there is a small spine, separated from the claw by a deep notch.

Total length, 200 $\mu$; length of lorica, 165 $\mu$; length of dorsal plate, 130 $\mu$, width, 125 $\mu$; width of anterior points, 78 $\mu$; width of ventral plate, 116 $\mu$; length of toe without claw, 42 $\mu$, claw, 20 $\mu$; depth of body, 93 $\mu$.

*Type.*—Cat. No. 16582, from a stagnant pool at Empire. It is not common.

This species has considerable resemblance to *Lecane ungulata* (Gosse). The latter is not as thick at *L. sibina*, and the body is relatively longer; its absolute dimensions are also considerably greater and the anterior margins are not coincident, the dorsal being nearly straight, while the ventral margin has a deep sinus.

### LECANE UNGULATA (Gosse).

*Cathypna ungulata* Gosse, Journ. Royal Micr. Soc., 1887, p. 361, pl. 8, fig. 1.

A single specimen from a pool near the railroad, between Black Swamp and Gatun (2).

### LECANE CURVICORNIS (Murray).

*Cathypna curvicornis* MURRAY, Journ. Royal Micr. Soc., 1913, p. 346, pl. 14, fig. 22.
? *Cathypna nitida* MURRAY, Journ. Royal Micr. Soc., 1913, p. 347, pl. 14, fig. 24.
*Cathypna lofuana* MURRAY, Journ. Royal Micr. Soc., 1913, p. 551, pl. 22, fig. 1.

Apparently these three names designate one and the same species. A specimen labeled *Cathypna curvicornis* was given me by Mr. Murray;

while this does show a smooth lorica and is without the three indentations of the posterior body segment, these characteristics occur frequently among Isthmian specimens which are undoubtedly specifically identical with Mr. Murray's *C. curvicornis*. The dorsal facetting figured for *C. nitida* is nearly always present; the posterior indentations of *C. lofuana* are less frequent, but occur in otherwise typical specimens, as does also the partly retracted anterior margin of this species.

The most distinctive peculiarities of *Lecane curvicornis* are best seen in a lateral view, compare plate 17, figure 3. The ventral plate is divided by a transverse fold, in front of which it is very deep and convex; the posterior section is nearly flat and correspondingly shallow. The toes have a short, sharp double curvature at the base; the posterior portion is slightly decurved. The spines at the base of the claw are at an angle of about 45 degrees with the body, so that a slight displacement makes them invisible, especially as they are very small and indistinct.

### LECANE LEONTINA (Turner).

*Canthypna leontina* TURNER, Bull. Denison Univ., vol. 6, 1892, p. 61, pl. 1, fig. 12.

In Black Swamp, near the railroad bridge (1), few; stagnant pool north of the railroad bridge over Black Swamp, few; pool near the railroad, between Black Swamp and Gatun (2), common; sluggish stream in savannas between Panama and Old Panama, rare; creek flowing into Camacho Reservoir (3), common; Rio Cocoli, above lake, rare; stagnant pool at Empire (4), abundant; pond east of canal at Empire (8), few.

### LECANE NANA (Murray).

*Cathypna nana* MURRAY, Journ. Royal Micr. Soc., 1913, p. 353, pl. 14, fig. 29.

From a pool near the railroad, between Black Swamp and Gatun, abundant.

### LECANE PLOENENSIS (Voigt).

*Distyla ploenensis* VOIGT, Zool. Anz., vol. 25, 1902, p. 679.
*Cathypna affinis* MURRAY, Journ. Royal Micr. Soc., 1913, p. 346.

A small variety of this species, about two-thirds the usual size, with rather indistinct markings, occurs on the Isthmus. My specimens were identified by Mr. Murray as identical with the animal he found at Rio de Janeiro. It was found in the following collections: Slow stream in the garden of the Isthmian Canal Commission, Empire, rare; pool near the railroad, between Black Swamp and Gatun (2), rare; creek flowing into Camacho Reservoir (3), few; stagnant pool at Empire (4), few; pond east of canal at Empire (8), rare; Rio Trinidad, about a mile from mouth (9), rare.

### LECANE LUDWIGII (Eckstein).

*Distyla ludwigii* Eckstein, Zeitschr. Wiss. Zool., vol. 39, 1883, p. 393, pl. 26, fig. 37.

From a creek flowing into Camacho Reservoir (3), few; pond east of canal at Empire (8), few; Rio Trinidad, at Escoval (11), rare.

### LECANE MARSHI, new species.

Plate 18, figs. 1–3.

The outline of the lorica is a bluntly pointed oval; the anterior margins of the dorsal and ventral plates are coincident and slightly excavate. The anterior spines are long, slender, and slightly tapering; the point is curved back as a conspicuous hook, in lateral view nearly semicircular. The dorsal plate is ovate and unusually narrow at the posterior end; its markings are quite regular and prominent. The ventral plate is narrower than the dorsal and of approximately the same outline; the lateral sulci are deep. The posterior segment of the body is roughly triangular in outline, slightly narrowed at the base of the rounded posterior lobe, which curves downward; on the dorsal side there are two parallel, transverse ridges on each side of the median line. The first foot joint is barely distinguishable and the second, movable joint is smaller than usual. At the sides of the foot joints there are two semicircular rounded plates, free posteriorly and slightly movable. These plates, for which the term coxal plates is used in this paper, are present in all the species of the genera *Lecane* and *Monostyla*, even when no other trace of the lorica remains; in some cases they are produced into posterior spines. The toes of *L. marshi* are fairly long, straight and parallel-sided, ending in bluntly conical points without any claw. The body is of a little more than average depth.

Total length, 173 μ; length of lorica, 138 μ; width of anterior edge over spines, 54 μ; height of hook, 9 μ; length of dorsal plate, 114 μ, width, 84 μ; width of ventral plate, 76 μ; length of toes, 45 μ; depth of body, 60 μ.

*Type.*—Cat. No. 16571, U.S.N.M., from a stagnant pool at Empire (4); it is apparently not common. It has been named for Dr. C. Dwight Marsh, of Washington City.

### LECANE ERCODES, new species.

Plate 18, figs. 4–6.

The lorica is oval in outline, ending posteriorly in a blunt, rounded lobe; the anterior dorsal and ventral edges are coincident. The dorsal plate is oval and truncate posteriorly; its markings are prominent and, with the exception of the first row, fairly regular. The ventral plate is slightly narrower than the dorsal and marked with longitudinal folds as shown in the figure. The anterior margin of the lorica is deeply excavate and produced into two long, stout anterior spines, slightly incurved and upcurved. The posterior segment of the body is broadly triangular, ending in a rounded lobe, slightly narrowed at the base and decurved; on the dorsal side there are two parallel, transverse ridges on each side of the median line. The first foot joint reaches down on the movable joint as a pointed lobe; the coxal plates are broad and rounded. The toes are fairly long, straight, and parallel-sided, ending in bluntly conical points without any claw. The body is of average depth.

Total length, 165 μ; length of lorica, 135 μ; width of anterior edge inside of spines, 48 μ; length of dorsal plate, 110 μ, width, 81 μ; width of ventral plate, 75 μ; length of toes, 42 μ; depth of body, 48 μ.

*Type.*—Cat. No. 16572, U.S.N.M., collected in a pool between Black Swamp and Gatun (2); only two specimens were found in the collection.

This species is closely related to *Lecane marshi;* it is noticeably broader posteriorly and the depth of the body is less; the anterior spines are, however, sufficient to distinguish the two. With *Lecane stokesii*, *L. ludwigii*, and *L. ohioensis* they form the most closely related group within the genus, differing principally in the form of the posterior segment of the body; the lorica is very firm in all of these species and the dorsal pattern differs only in the first row of markings.

### LECANE FLEXILIS (Gosse).

Plate 19, figs. 1–3.

*Distyla flexilis* GOSSE, Hudson and Gosse, Rotifera, 1886, vol. 2, p. 97, pl. 24, fig. 7.

? *Distyla lipara* GOSSE, Journ. Royal Micr. Soc., 1887, p. 867, pl. 15, fig. 16

? *Cathypna brevis* MURRAY, Journ. Royal Micr. Soc., 1913, p. 555, pl. 22, fig. 8.

The lorica is very nearly circular; the small posterior segment is almost covered by the dorsal plate of the lorica and the anterior margins are coincident. The dorsal plate is subcircular and its anterior margin convex with two short, very stout, slightly incurving frontal spines. The markings of the dorsal plate are very prominent and of an unusual pattern; there are four transverse rows of ridges, the first row broken, the other three fairly regular with 7, 8, and 7 ridges respectively. The ventral plate is considerably narrower than the dorsal and quite flexible, with ill-defined lateral edges; the markings are constant in front, becoming more variable toward the foot. The posterior segment of the body is rounded and projects but little beyond the dorsal plate; the coxal plates are nearly semicircular. The first foot joint is elongate-oval and the movable joint broad and rhomboid. The toes are short, with a well marked, recurved claw; their inner edges are straight, while the outer edge has a double curve, so that the toe is a trifle broader in the middle than just beyond the base. From the middle the toe tapers gently to the claw; in lateral view it is slightly decurved and tapering; there is a minute, but distinct spine projecting dorsally over the claw. The depth of the body is greater than that of any other described species of the genus; the lateral sulci are almost obliterated in retraction; on account of the flexibility of the membrane connecting the dorsal and ventral plates, its appearance is very variable.

Total length, 96 μ; length of lorica, 76 μ; length of dorsal plate, 72 μ, width, 66 μ; width of ventral plate, 50 μ; anterior spines 55 μ; toes without claw 19 μ, claw, 4 μ; depth of body, 50 μ.

While the contracted animal does not resemble Gosse's figure very much, the agreement is in the extended condition so striking that there can be no doubt of the identification. When fully extended and swimming, the length is very nearly twice as great, the body is slender and flattened dorso-ventrally and the dorsal markings become much more prominent. While Gosse's figure of the toes is not correct, the same may be said of the majority of the species of this genus, with which he had occasion to deal.

*Lecane flexilis* is widely distributed; in the Panama collections it was found in a creek flowing into Camacho Reservoir (3), common; stagnant pool at Empire (4), common. Mr. Rousselet has sent me specimens collected by Mr. Murray in Brazil; it is found here at Washington and in great abundance in collections from Loch Raven, near Baltimore, Maryland, also in material from the Bureau of Fisheries station at San Marcos, Texas; I have found it in Sphagnum sent me from various localities in England by Mr. David Bryce.

*Cathypna brevis* Murray shows considerable resemblance to this species; if the toes are correctly described it is, however, a good species.

### LECANE ARCULA, new species.

Plate 19, figs. 4–6.

*Cathypna aculeata* MURRAY, Journ. Royal Micr. Soc., 1913, p. 350, pl. 14, fig. 28; not *Distyla aculeata* Jakubski.

The general form of the lorica is ovate and but little longer than broad; the body is unusually thick. The dorsal and ventral anterior margins of the lorica are both straight and nearly coincident; they are produced laterally into two small, pointed spines, which are broad at the base and directed slightly upward and outward. The dorsal plate of the lorica is ovate and rounded posteriorly; it is strongly gibbous and projects over the posterior segment of the body so far that it nearly conceals it in a dorsal view. The dorsal markings are rather faint; there are the usual four transverse rows of ridges, which are fairly regular. The exact pattern can perhaps better be understood from the figure than from any description. These ridges do not form true facets in any of the species of the genera *Lecane* and *Monostyla;* some species do have facets, but the limiting lines do not project as ridges above the surface of the lorica. The majority of the species having prominent ridges on the dorsal plate change their form considerably in retraction; the species with true facets or without any dorsal markings do not as a rule change much. This does not refer to the virtually illoricate species, all moss-dwellers, which do not assume any fixed, recurring outline in retraction. The ventral plate of *Lecane arcula* is of nearly the same outline as the dorsal and of equal width; it has rather conspicuous markings. The posterior segment of the body is prominent, but nearly covered by the dorsal plate. The first, immovable foot joint is nearly parallel-sided and pointed posteriorly, where it reaches down over the movable second foot joint; this is quite broad at the base and suddenly narrowed immediately behind the lorica. The toes are short, rather slender, and in dorsal view parallel-sided; in lateral view they are broad at the base and taper rapidly. The claw is of moderate length, very slender and recurved.

Total length, 96 μ; length of lorica, including spines, 68 μ; length of dorsal plate, including spines, 63 μ, width, 55 μ; width over anterior spines, 47 μ; length of spines, 5 μ; length of toes without claw, 18 μ, claw, 5 μ; depth of body, 45 μ.

*Type.*—Cat. No. 16573, U.S.N.M. It was taken from a stagnant pool at Empire (4), where it was very abundant; it is common and widely distributed on the Isthmus: Pool between Black Swamp and Gatun (2); creek flowing into Camacho Reservoir (3); Rio Grande, (6); Rio Trinidad, 1 mile from mouth (9), and above Agua Clara (10), also at Escoval (11).

Murray identifies this species with *Distyla aculeata* Jakubski. While there is no doubt a certain general similarity, it does not extend to details; Jakubski's animal is more elongate and widest in front, the body is very thin and the dorsal plate smooth, the anterior spines measure 14 μ, while in the South American species they are only 5 μ long. The conclusion that the two are different species is therefore unavoidable.

### LECANE COMPTA, new species.

Plate 20, figs. 1-3.

*Cathypna flexilis?* Murray, Journ. Royal Micr. Soc., 1913, p. 351, pl. 14, fig. 27; not *Distyla flexilis* Gosse.

The general form of the body is a slightly elongate oval; the anterior margins of the dorsal and ventral plates are straight and coincident, the anterior spines minute. The depth of the body is moderate and the entire lorica very flexible. The dorsal plate is oval, truncate in front and narrow posteriorly; the dorsal markings are prominent, but in the three anterior rows only the median fields are regular. The ventral plate is slightly narrower than the dorsal and has prominent markings of the pattern shown in figure 1. The posterior segment is large and bluntly pointed; the coxal plates are small and semicircular. The first foot joint is well marked; the movable joint is large and subsquare. The moderately long toes are parallel-sided, slightly decurved and taper abruptly to a fine point, but there is no true claw.

Total length, 115 $\mu$; length of lorica, 80 $\mu$; length of dorsal plate 70 $\mu$, width, 60 $\mu$; width of ventral plate 56 $\mu$; width of anterior spines, 54 $\mu$; width of anterior edge of dorsal plate 45 $\mu$; length of toes, 30 $\mu$; depth of body, 45 $\mu$.

*Type.*—Cat. No. 16575, U.S.N.M., from a stagnant pool at Empire (4), where the species is abundant; common in a pool between Black Swamp and Gatun (2) and in Rio Trinidad, above Agua Clara (10).

Murray identifies this animal with some misgivings with *Distyla flexilis* Gosse. His figure seems to have been drawn from an abnormal (dried ?) specimen, at least none of the numerous specimens in the Panama collections resembles it very much.

### LECANE PUSILLA, new species.

Plate 20, figs. 4–6.

The body of this small species is but little longer than broad and very thick; the anterior margin of the dorsal plate projects beyond the ventral plate. Both are straight; they do not meet even in complete retraction, but leave the lorica widely open in front; no spines are present at the antero-lateral angles of the lorica. The dorsal plate is nearly circular; the markings are of an unusual pattern, as one pair of ridges overlap from the second to the third row. The ventral plate is parallel-sided in its anterior half and rounded posteriorly; only the central markings are conspicuous. The lateral sulci are deep. The rounded posterior segment projects considerably beyond the dorsal plate; the coxal plates are of moderate size and semicircular. The first foot joint is barely distingusihable, while the second is unusually large. The toes are short and nearly straight with a slender, recurved claw, which is occasionally directed slightly outward, as shown in fig. 4; usually they are in the axis of the toe. (See fig. 6.)

Total length, 75 $\mu$; length of lorica, 60 $\mu$; length of dorsal plate, 54 $\mu$, width, 52 $\mu$; width of anterior edge, 38 $\mu$; width of ventral plate, 45 $\mu$, anterior edge, 50 $\mu$; length of toes without claw, 15 $\mu$, claw, 5 $\mu$; depth of body, 40 $\mu$.

*Type.*—Cat. No. 16574, U.S.N.M., is from a stagnant pool at Empire (4), where it is common; also in Rio Grande (6).

This species is closely related to *Lecane nana* (Murray); it differs mainly in having fairly strong markings on the lorica, while *L. nana* is smooth; in the latter the toe is without any claw.

### LECANE AEGANEA, new species.

Plate 21, figs. 1–3.

The body is moderately elongate-oval and not very thick; the anterior dorsal margin is slightly convex and the ventral margin straight; they do not meet when the head is retracted, but leave the lorica partly open; no anterior spines are present. The dorsal plate is oval and rounded posteriorly; the markings are fairly regular and not very conspicuous. The ventral plate is larger than the dorsal and projects beyond it, except in front; its markings are prominent, especially on the posterior half. The lateral sulci are not very deep and the entire lorica quite flexible. The posterior segment of the body is inconspicuous; the coxal plates are very small and semicircular. The first foot joint is very long, but almost obliterated near the middle; the second joint is large and has a sharp constriction immediately in front of the toes, which are moderately long, slender, and nearly straight, and end in a very long, slightly recurved and delicate claw.

Total length, 110 $\mu$; length of lorica, 76 $\mu$; length of dorsal plate, 70 $\mu$, width 56, $\mu$, width of anterior edge, 42 $\mu$; width of ventral plate, 60 $\mu$, anterior edge, 50 $\mu$; toes without claw, 24 $\mu$, claw, 10 $\mu$; depth of body, 36 $\mu$.

*Type.*—Cat. No. 16577, U.S.N.M., is from a pool near the railroad, between Black Swamp and Gatun (2); it is not common.

### LECANE DORYSSA, new species.

Plate 21, figs. 4–6.

The body is but little longer than broad and excessively thick and clumsy. While the outlines are wavy and somewhat indefinite, the lorica is nevertheless quite firm and may perhaps best be described as leathery. The anterior dorsal margin is slightly convex and sinuate, as the dorsal ridges reach to the edge; the ventral edge is almost straight and there are no frontal spines. The dorsal plate is nearly circular, slightly truncate posteriorly, and is very deeply marked; the anterior row of ridges is somewhat irregular, while the second row is entirely broken up with the exception of the median field; the two posterior rows are regular. The ventral plate is slightly narrower than the dorsal and nearly parallel-sided in its entire length, but narrows abruptly to the posterior segment. The ventral markings are very prominent, especially so on the median field, which in outline approximates a reversed shield. The lateral sulci are shallow and much wrinkled. The posterior segment is large and projects considerably beyond the dorsal plate; the coxal plates are large and rounded. The first foot joint is prominent, much constricted near the middle, and reaches down on the second joint as a broad lobe with a blunt point. The second joint is subsquare and very large; it projects beyond the lorica for more than two-thirds of its length. The toes are short and slightly compressed; the claw is nearly as long as the toe, very slender and straight.

Total length, 106 μ; length of lorica, 70 μ; length of dorsal plate, 58 μ, width, 60 μ, width of anterior margin, 52 μ; width of ventral plate, 58 μ, width of anterior margin, 56 μ; length of toe without claw, 17 μ, claw, 13 μ; depth of body, 45 μ.

*Type.*—Cat. No. 16576, U.S.N.M., is from a pool near the railroad between Black Swamp and Gatun (2); it is not common.

The nearest relative of this species is *L. hornemanni*, which rivals it in thickness of body and also resembles it in general appearance. The lorica of *L. hornemanni* has deeper wrinkles of a different pattern; the toes are quite different, and the peculiar coxal plates, ending in points close to the foot, also distinguish it from *L. doryssa*.

### LECANE HORNEMANNI (Ehrenberg).

*Cathypna hornemanni* MURRAY, Journ. Royal Micr. Soc., 1913, p. 349, pl. 14, fig. 26.

From a pool near the railroad, between Black Swamp and Gatun (2), few; from water plants near railroad bridge, Gatun Lake, common; creek flowing into Camacho Reservoir (3), few; Rio Grande Reservoir (5), abundant; Rio Grande (6), few; Rio Trinidad, above Agua Clara (10), few.

### LECANE TENUISETA, new species.

Plate 22, figs. 1–3.

The outline of the body is a slightly elongate oval; the anterior margins are parallel and usually a trifle convex in the median half of their width; they leave the lorica partly open in retraction, as they do not quite meet. The body is fairly thick. The dorsal plate is oval, rounded posteriorly, and without markings; it is strongly gibbous and bends down considerably even in front. The ventral plate is of the same width as the dorsal and similar outline; its markings consist of a few ridges, shown in figure 1. The lateral sulci are very shallow. The posterior segment of the body is broad and rounded and projects considerably beyond the dorsal plate; the coxal plates are large and semicircular. The first foot joint is narrow and parallel-sided, and reaches down on the second joint as a bluntly pointed lobe. The second joint is broad, rounded anteriorly, and constricted immediately in front of the toes, which are slender, slightly compressed, and rather short. The claw is more than two-thirds the length of the toe, very slender, recurved and outcurved. The lorica is membranous and very flexible.

Total length, 106 μ, length of lorica, 73 μ; width, 56 μ, length of dorsal plate, 64 μ, width of anterior edge, 45 μ; width of anterior edge of ventral plate, 52 μ, length of toe without claw, 20 μ, claw, 13 μ.

Isthmian specimens are from a creek flowing into Camacho Reservoir (3), where the species is common.

*Type.*—Cat. No. 16579, U.S.N.M., from Kenilworth, District of Columbia, where the species occurs in Sphagnum. It is found also in material collected near the Bureau of Fisheries station at San Marcos, Texas. As the Washington specimens are better preserved, the description and measurements are taken from these. Isthmian specimens are considerably smaller, but do not otherwise differ materially.

This species bears considerable resemblance to *L. aeganea;* the difference in the toes and the markings of the lorica are sufficient to distinguish the two.

### LECANE AMORPHA, new species.

Plate 23, figs. 1 and 2.

This species is virtually illoricate and on account of the great flexibility of the integument the contracted animals vary very much in appearance. The body is unusually elongate and nearly parallel-sided; the anterior margin is the irregularly puckered edge resulting from the inversion of the head. The posterior half of the body shows rudimentary lateral sulci. The posterior segment of the body is normally developed, broad and rounded; the coxal plates are large and semicircular. The first foot joint is narrow and parallel-sided, the second subsquare, slightly wider posteriorly. The toes are short, straight, and slender; the claw is nearly as long as the toe, slender, tapering, obtusely pointed, and slightly recurved.

Total length, 105 μ; length of body, 80 μ, width, 40 μ; length of toes without claw, 14 μ, claw, 10 μ; depth of body, 30 μ. These measurements are only average; owing to the flexibility of the integument any number of different measurements may be obtained.

*Type.*—Cat. No. 16580, U.S.N.M., from Rio Trinidad at Escoval (11), in weeds along shore, where it is common. It is also found here at Washington in Sphagnum from Kenilworth.

### LECANE ELEGANS, new species.

Plate 23, figs. 3 and 4.

The body is elongate, slender, and parallel-sided; the dorsal plate is very flexible, the ventral much less so. The anterior margin of the ventral plate is nearly straight and of fairly constant form; the dorsal margin is irregularly puckered by the inversion of the head. The dorsal plate is strongly convex, nearly semicircular in cross section. Lateral sulci are barely indicated on the posterior third of the body;

the ventral plate may be said to be joined directly to the dorsal; it has prominent longitudinal ridges. The posterior segment of the body is very large and unusually prominent; it may be considered as beginning near the middle of the ventral plate and is, seen from the ventral side, ovate, broadest posteriorly. Coxal plates are not present. The first foot joint is extremely long, tapering posteriorly to half its anterior width; the elongate second joint is parallel-sided and strictly terminal. The toes are very long, slender, and slightly recurved in the posterior third. The claw is nearly half as long as the toe, strongly outcurved and slightly recurved; at the base of the claw there is a conspicuous, laterally directed spine.

Total length, 170 μ; length of body, 108 μ, width, 45 μ; toe without claw, 36 μ, claw, 15 μ; depth of body, 48 μ.

*Type.*—Cat. No. 16581, U.S.N.M., from Rio Grande Reservoir (5); but few specimens were collected.

### MONOSTYLA CORNUTA (Müller).

*Monostyla robusta* MURRAY, Journ. Royal Micr. Soc., 1913, p. 557, pl. 23, fig. 21.

Murray considers this species different from *Trichoda cornuta* Müller, as it has a shorter toe and a nearly straight anterior margin. It is quite true that the toe is a trifle shorter than in Müller's figure, but the specimens studied by Mr. Murray were not fully contracted, and so did not show the lunate anterior margin, which is normally as deep as in *Monostyla lunaris*. There can be no doubt about the identity of this form and the one figured by Ehrenberg as *Monostyla cornuta*. That Ehrenberg's identification was incorrect is quite possible; as there is no positive proof that he was in error, he is entitled to the benefit of the doubt. *M. cornuta* has been repeatedly ruled out because Müller figures the claw as double; as a matter of fact, a careful examination of large amounts of material of both species demonstrates that the claw is really double in both species, although the two parts are very rarely separated in *M. lunaris* and seldom in *M. cornuta*.

In the Isthmian material two forms of this species occur; one which may be called the normal measures: Length of body 126 μ, of toe 42 μ, of claw 9 μ, and a diminutive form with a relatively much longer claw, which measures: Length of body 85 μ, of toe 23 μ, of claw 9 μ.

The normal form occurs: In a pool near the railroad, between Black Swamp and Gatun (2), few; creek flowing into Camacho Reservoir (3), abundant; stagnant pool at Empire (4), common; Rio Grande Reservoir (5), abundant; Rio Grande (6), few; pond east of canal at Empire (8), few; Rio Trinidad, about 1 mile from mouth (9), common; above Agua Clara (10), common; at Escoval (11), a single specimen. The long-clawed form was found in Rio Grande Reservoir (5), common.

### MONOSTYLA LUNARIS Ehrenberg.

This supposedly cosmopolitan species is, strange to say, rare in the Isthmian collections; a single specimen from a creek flowing into Camacho Reservoir (3) and two from Rio Grande Reservoir (5) is the total number of observed specimens. This contrasts strongly with the remarkable abundance of other species of the genus, as well as of *Lecane.*

### MONOSTYLA VIRGA, new species.

Plate 24, figs. 1–3.

The body is ovate and strongly gibbous posteriorly. The anterior margins are nearly coincident; the anterior sinus of the dorsal plate is not quite as deep as that of the ventral, and at the bottom it has a short straight line, while the ventral sinus is rounded; both have their sides slightly convex; anterior spines are not present. The dorsal plate is oval and but little longer than broad; the anterior margin is considerably narrower than that of the ventral plate. The outline of the ventral plate is nearly the same as that of the dorsal; it is slightly narrower and somewhat angular posteriorly, with a conspicuous transverse fold. The lateral sulci are deep, as indicated by a faint line in figure 3; the lorica is not tesselate. The posterior segment of the body is small and rounded; it projects but little beyond the lorica. The coxal plates are small and obtusely triangular. The first foot joint is pyriform, the second large and rounded. The toe is long, parallel-sided, fairly stout and slightly decurved; it has two obscure annular constrictions. The claw is short and stout; it is distinctly double, although the two parts are only rarely separated.

Total length, 138 $\mu$; length of lorica, 84 $\mu$; width of anterior edge of dorsal plate, 32 $\mu$, of ventral plate, 42 $\mu$; length of dorsal plate, 78 $\mu$, width, 72 $\mu$; width of ventral plate, 66 $\mu$; length of toe without claw, 48 $\mu$, claw, 6 $\mu$; depth of body, 45 $\mu$.

*Type.*—Cat. No. 16584, U.S.N.M., from Rio Grande Reservoir (5), where the species is abundant. The species occurs also in a pool between Black Swamp and Gatun (2), few; pond at Bohio (7), few; pond east of Empire (8), few; Rio Trinidad, above Agua Clara (10), few; at Escoval (11), few.

This species has considerable resemblance to *Monostyla crenata* and was at first supposed to be a small variety of the latter; this, as it proved later, erroneous assumption is the basis of the record in the original description[1] of *M. crenata* as common in Isthmian collections. The lateral view of *M. virga* shows at once that it is a different species. In *M. crenata* the lorica is widely open in front, when the head is completely retracted.

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[1] Proc. U. S. Nat. Mus., vol. 46, 1913, p. 399.

### MONOSTYLA PYRIFORMIS Daday.

*Monostyla truncata* MURRAY, Journ. Royal Micr. Soc., 1913, p. 358, pl. 15, fig. 38.

Partly contracted specimens agree perfectly with Daday's figure, while the fully contracted material corresponds with Murray's. The name given by Daday is used here, in preference to Turner's; while the possibility that they may be the same species is not excluded, positive evidence is lacking. *M. truncata* Turner is here listed as a probable synonym of *M. closterocerca* Schmarda. It seems to the writer inadvisable to simply "use up" the names given in the past without sufficient description to enable one to form any definite opinion as to the identity of the animal actually before the original observer, as such "resurrections of the dead" tend to befog the question of distribution. If we use Turner's name for this South American species, it will of course figure in all lists as being common to both North and South America. That such is really the case is very doubtful; *M. pyriformis* was described by Daday from Paraguay, Murray found it in Brazil, and it is not rare on the Isthmus. Taken together, this indicates that the species is common and widely distributed in South America. To give it an "all-American" distribution merely on the strength of Turner's unrecognizable figure is unwarranted and misleading in the face of an abundance of presumptive evidence that the species of the genera *Lecane* and *Monostyla* usually have a rather circumscribed distribution.

This species occurs: In a pool near the railroad, between Black Swamp and Gatun (2), few; creek flowing into Camacho Reservoir (3), few; stagnant pool at Empire (4), few; Rio Grande Reservoir (5), common; Rio Grande (6), rare; Rio Trinidad, about 1 mile from mouth (9), rare; above Agua Clara (10), rare.

### MONOSTYLA BULLA Gosse.

In a pool near the railroad, between Black Swamp and Gatun (2), common; sluggish stream in savannas between Panama and Old Panama, few; Gatun Lake, few; creek flowing into Camacho Reservoir (3), abundant; Rio Cocoli, above lake, few; stagnant pool at Empire (4), abundant; Rio Grande Reservoir (5), common; Rio Grande (6), few; pond east of Canal at Empire (8), few; Rio Trinidad, above Agua Clara (10), abundant.

### MONOSTYLA QUADRIDENTATA Ehrenberg.

This species was found only in the following collections: Stagnant pool at Empire (4), common; Rio Grande Reservoir (5), few; Rio Trinidad, above Agua Clara (10), few.

### MONOSTYLA CLOSTEROCERCA Schmarda.

*Monostyla closterocerca* MURRAY, Journ. Royal Micr. Soc., 1913, p. 357, pl. 15, fig. 39.

? *Monostyla truncata* TURNER, Bull. Denison Univ., vol. 6, 1892, p. 62, pl. 1, fig. 11.

From a pool near the railroad, between Black Swamp and Gatun (2), common; creek flowing into Camacho Reservoir (3), common; Rio Grande Reservoir (5), few; Rio Trinidad, above Agua Clara (10), few; at Escoval (11), few.

This species does not have the fusiform toe figured by Schmarda and Murray; the toe is parallel-sided for about half its length and from there tapers rapidly to a long, slender point.

### MONOSTYLA HAMATA Stokes.

In collection from a creek flowing into Camacho Reservoir (3), common; stagnant pool at Empire (4), common; Rio Grande Reservoir (5), few; Rio Trinidad, above Agua Clara (10), common; at Escoval (11), few.

### MONOSTYLA DECIPIENS Murray.

In a pool near the railroad between Black Swamp and Gatun (2), few; creek flowing into Camacho Reservoir (3), rare; Rio Grande Reservoir (5), few.

### MONOSTYLA FURCATA Murray.

Abundant in a pool near the railroad, between Black Swamp and Gatun (2); creek flowing into Camacho Reservoir (3), rare; stagnant pool at Empire (4), abundant; Rio Grande (6), rare; Rio Trinidad, about 1 mile from mouth (9), few; above Agua Clara (10), few; at Escoval (11), few.

### MONOSTYLA OBTUSA Murray.

Among water plants near the railroad bridge, Gatun Lake, rare; stagnant pool at Empire (4), common; Rio Grande Reservoir (5), common; Rio Trinidad, above Agua Clara (10), few.

### MONOSTYLA RUGOSA, new species.

Plate 24, figs. 4–6.

The ovate body is short, very broad, and excessively thick. The anterior margins of the lorica are nearly straight and almost coincident; there are no anterior spines. The broadly ovate dorsal plate is slightly truncate posteriorly; the width is greater than the length and its anterior margin is narrower than that of the ventral plate. The dorsal markings are very deep and the fields of the two anterior rows irregular, while the third and fourth row are fairly regular.

The ventral plate is subsquare and much narrower than the dorsal. As it is very flexible, the lateral margins are undulate and not very distinct. The wrinkling of the median portion of the ventral plate is constant and of the pattern shown in figure 4. The lateral sulci are indistinct and shallow. The posterior segment of the body is very short and broad; it is almost concealed by the dorsal plate. The coxal plates are large and semicircular. The first foot joint is very small and parallel-sided, the second also rather small. The toe is of moderate length and has a long, double claw, the two parts of which are rarely separated.

Total length, 84$\mu$; length of lorica, 57$\mu$; length of dorsal plate, 54$\mu$; width 62$\mu$; width of ventral plate, 56$\mu$; anterior edge of dorsal plate, 34$\mu$, of ventral plate, 45$\mu$; length of toe without claw, 21$\mu$; claw, 6$\mu$; depth of body, 42$\mu$.

*Type.*—Cat. No. 16583, U.S.N.M., from Rio Grande Reservoir (5), where the species is abundant. It also occurs in the following collections: Pool near the railroad, between Black Swamp and Gatun (2), common; Rio Grande (6), few; Rio Trinidad, above Agua Clara (10), few.

### MONOSTYLA BIFURCA Bryce.

From a creek flowing into Camacho Reservoir (3), common.

### LEPADELLA PATELLA (Müller).

*Metopidia emarginata* HUDSON and GOSSE, Rotifera, Suppl., 1889, p. 46, pl. 34, fig. 6.

While recorded only from Rio Trinidad, at Escoval (11), it is quite probable that many specimens have been overlooked, as the collections nearly all contained a considerable amount of floccose, diatoms, desmids, etc.

### LEPADELLA SOLIDUS (Gosse).

*Metopidia solidus* GOSSE, Ann. Mag. Nat. Hist., ser. 2, vol. 8, 1851, p. 201.

In a creek flowing into Camacho Reservoir (3), common; Rio Trinidad, above Agua Clara (10), rare.

### LEPADELLA TRIPTERA Ehrenberg.

From Rio Grande Reservoir (5), common; Rio Grande (6), few.

### LEPADELLA IMBRICATA, new species.

Plate 16, figs. 3–5.

The body is subovate, a little broader anteriorly. The lorica is strongly gibbous with a very faint dorsal ridge; the ventral plate also has a faint ridge, which only extends for about two-thirds of its length. Two shallow longitudinal depressions extend the length of the body, half way between the dorsal ridge and the lateral margins of the lorica. The ventral plate has an indistinct groove on each side, close to the lateral margin, as shown in the cross section of the body, figure 5. The anterior dorsal margin is straight, the ventral has a deep, V-shaped sinus. The foot opening is long, narrow, and nearly parallel sided. The foot is long and slender; it has four joints, the posterior being nearly as long as the three anterior joints. The toes are straight, excessively long, and taper gradually to acute points.

Total length, 128 μ; length of lorica, 86 μ, width, 54 μ; depth, 39 μ; width of anterior sinus, 29 μ, depth, 18 μ; length of foot opening, 25 μ, width, 15 μ; length of foot, 39 μ, of last joint, 15 μ; length of toes, 27 μ.

*Type.*—Cat. No. 16586, U.S.N.M., from Kenilworth, District of Columbia, where the species occurs in weedy ponds, not very common. Isthmian specimens are from a stagnant pool at Empire (4), few; Rio Trinidad, at Escoval (11), few.

### LEPADELLA CYRTOPUS, new species.

Plate 16, figs. 6–8.

The body is broadly oval and evenly rounded dorsally; the ventral plate has near each lateral edge a very shallow longitudinal depression. The anterior dorsal margin is nearly straight; the ventral plate has a very deep, evenly rounded anterior sinus. The foot opening is short, very broad, and widest posteriorly. The moderately long foot has four joints; the first, second, and fourth are nearly equal in length and the third joint equals the combined length of the first and second. The moderately long toes are asymmetric; the right toe tapers rapidly for half its length and ends in a very slender, acute point; the left toe tapers gradually to the point and is strongly decurved. The last joint of the foot is twisted, so that the curved left toe is almost directly under the right.

Total length, 98 μ; length of lorica, 70 μ, width, 56 μ, depth, 29 μ; width of anterior sinus, 24 μ, depth, 19 μ; length of foot opening, 17 μ, posterior width, 15 μ; length of foot, 32 μ, of third joint, 11 μ; length of right toe, 16 μ.

*Type.*—Cat. No. 16585, U.S.N.M., from a creek flowing into Camacho Reservoir (3), where the species is common. It also occurs in a pool near the railroad, between Black Swamp and Gatun (2), few; stagnant pool at Empire (4), few; Rio Grande Reservoir (5), common; Rio Grande (6), few.

### COLURELLA BICUSPIDATA (Ehrenberg).

In a creek flowing into Camacho Reservoir (3), few; Rio Grande Reservoir (5), few.

### COLURELLA UNCINATA (Müller).

In a creek flowing into Camacho Reservoir (3), common; stagnant pool at Empire (4), few; Rio Grande Reservoir (5), few; Rio Grande (6), few.

### SQUATINELLA MUTICA (Ehrenberg).

*Stephanops muticus* Ehrenberg, Abh. Akad. Wiss., Berlin (for 1831), 1832, p. 138.

A single specimen from a creek flowing into Camacho Reservoir (3).

### TRICHOTRIA TETRACTIS (Ehrenberg).

*Dinocharis tetractis* Ehrenberg, Abh. Akad. Wiss., Berlin, 1830, p. 47.

In a pool near the railroad, between Black Swamp and Gatun (2), rare; Rio Trinidad, above Agua Clara (10), few.

### MACROCHAETUS COLLINSII (Gosse).

*Dinocharis collinsii* Gosse, Int. Obs., vol. 10, 1867, p. 269, fig.

In a pool near the railroad, between Black Swamp and Gatun (2), few; creek flowing into Camacho Reservoir (3), few; Rio Cocoli, above lake, rare; stagnant pool at Empire (4), common; Rio Grande (6), rare.

### SCARIDIUM EUDACTYLOTUM Gosse.

A single specimen from a pond east of Canal at Empire (8).

### SCARIDIUM LONGICAUDUM (Müller).

In a creek flowing into Camacho Reservoir (3), few; stagnant pool at Empire (4), few; Rio Trinidad, above Agua Clara (10), few.

### TRICHOCERCA BICRISTATA (Gosse).

*Rattulus bicristatus* Jennings, Bull. U. S. Fish Comm., vol. 22, 1903, p. 330, pl. 9, figs. 77–80.

From a pond east of canal at Empire (8), rare; Rio Trinidad, at Escoval (11), few.

### TRICHOCERCA PUSILLA (Jennings).

*Rattulus pusillus* Jennings, Bull. U. S. Fish Comm., vol. 22, 1903, p. 339, pl. 9, figs. 81–85.

From a stagnant pool at Empire (4), few; Rio Grande Reservoir (5), few; pond at Miraflores, back water of Rio Camitillo (12), few.

### TRICHOCERCA NITIDA, new species.

Plate 17, fig. 2.

The body is moderately long, straight on the ventral side and gibbous dorsally. The head sheath is set off from the body by a faint constriction; it has a number of obscure longitudinal folds. The anterior margin is sinuate and without any teeth or spines. The striated area is a little less than one-third the length of the body. The posterior opening of the lorica is large and the bulbous foot projects some distance through it. The toe is half the length of the body, slightly recurved at the base and straight posteriorly; it is accompanied by two minute substyles. The dorsal antenna is on the striated area, opposite the constriction separating the head sheath from the body; the left lateral antenna is on the posterior third of the body; the right antenna has not been observed.

Total length, 182 μ; length of body, 122 μ, depth, 45 μ; length of toe, 60 μ.

*Type.*—Cat. No. 16587, U.S.N.M., is from a pond at Bohio (7); the species also occurs in a stagnant pool at Empire (4) and Rio Trinidad, at Escoval (11); only a few specimens were found in each of the collections mentioned.

This species has some resemblance to *Trichocerca pusilla* (Jennings); the body is, however, much more slender.

### TRICHOCERCA RATTUS (Müller).

*Rattulus rattus* Jennings, Bull. U. S. Fish Comm., vol. 22, 1903, p. 333, pl. 11, figs. 100, 101.

From Rio Grande Reservoir (5), rare; Rio Trinidad, at Escoval (11), few; pond north of fill work at Miraflores, back water of Rio Camitillo (12), rare.

### DIURELLA BRACHYURA (Gosse).

In a creek flowing into Camacho Reservoir (3), few; pond west of Rio Chagres, at Bohio (7), rare; Rio Trinidad, at Escoval (11), few.

### DIURELLA WEBERI Jennings.

In a creek flowing into Camacho Reservoir (3), few; Rio Grande, (6), rare.

### DIURELLA VOLUTA Murray.

Owing to an insufficiency of material, the measurements were not given by Murray in the original description. The length of the lorica is 135 μ; length of toes, from 36 to 42 μ; depth of body, 54 μ; width of body over keel, 54 μ; of body alone, 45 μ.

This species occurred in collections from Rio Grande Reservoir (5), not common.

### DIURELLA STYLATA Eyferth.

From Rio Grande Reservoir (5), few; Carabali (Gorgona) Reservoir, common; Rio Trinidad, at Escoval (11), few; pond at Miraflores, back water of Rio Camitillo (12), few.

### DIURELLA TIGRIS (Müller).

From a creek flowing into Camacho Reservoir (3), common; Rio Grande Reservoir (5), few; Rio Grande (6), few; pond east of canal at Empire (8), rare.

### DIURELLA TENUIOR (Gosse).

From Rio Trinidad, at Escoval (11), few.

### DIURELLA DIXON-NUTTALLI Jennings.

From a pond at Miraflores, back water of Rio Camitillo (12), few.

### POLYARTHRA TRIGLA Ehrenberg.

*Polyarthra platyptera* EHRENBERG, Infusionsth., 1838, p. 441, pl. 54, fig. 3.

In Gatun Reservoir, few; Camacho Reservoir, few; Rio Grande Reservoir (5), common; Carabali (Gorgona) Reservoir, few; Rio Trinidad, at Escoval (11), few; pond at Miraflores, back water of Rio Camitillo (12), common.

### ASPLANCHNA BRIGHTWELLII Gosse.

Isthmian specimens from both localities have trophi of a pronounced *amphora* type,[1] with a strongly developed inner tooth on the rami. It is improbable that this is of any special significance; in a pond at Fourmile Run, near Washington, where this species is abundant, all the material collected in 1913 had the *amphora* type of trophi, while this year the normal *brightwellii* type, without the inner tooth, is the only one found. It should be explained that the character of this pond has changed; last year it was without any fixed vegetation and the fauna practically limnetic in its composition. This year there is an abundance of vegetation, mainly *Potamogeton crispum*, which in places forms large tangled masses, and the fauna is now a characteristic stagnant-pond fauna.

This species occurred in a stagnant stream under the old bridge, Old Panama, probably Rio Alcorobo, common; Gatun Lake, abundant.

### TESTUDINELLA INCISA (Ternetz).

*Pterodina incisa* TERNETZ, Rot. Umg. Basels, 1892, pp. 20, 41, pl. 3, figs. 19, 20.

In creek flowing into Camacho Reservoir (3), few; Rio Trinidad, above Agua Clara (10), rare.

### ? TESTUDINELLA TRILOBATA (Anderson and Shephard).

*Pterodina trilobata* ANDERSON and SHEPHARD, Proc. Royal Soc. Victoria, vol. 4, 1892, p. 79, pl. 12, fig. 7.

Among material collected from the railroad bridge over Black Swamp (1) a single specimen of a very large *Testudinella* occurred. It corresponds closely with the figure in Kirkman's paper[2] with one exception, the median lobe of the anterior dorsal margin is produced as a long, slender spine. The length of the lorica, measured from the rounded lateral lobes, is 300μ, width, 275μ; length of spine, 40μ. *T. mucronata* (Gosse) has an anterior spine, but in specimens of this species from Mexico City it is broad at the base and without the lateral lobes of *T. trilobata.* Mexican specimens measure 150 μ (Gosse and Weber give the size as 140 μ), which would hardly appear compatible with the specific identity of the two forms. Whether Kirkman's specimens really belong to *T. trilobata* is a matter of some doubt. It is not evident from the original description that *T. trilobata* differs materially from *T. intermedia* Anderson and both are probably synonymous with *T. patina* (Hermann). The peculiar structure of the ovary described by Rousselet in a note to Kirkman's paper is not mentioned by Anderson and Shephard; it is even more pronounced in the Black Swamp specimen, the left half of the ovary having three distinct branches. This species occurs also in collections made by Dr. Chancey Juday, of the University of Wisconsin, at Los Amates, Guatemala. Daday found it in Paraguay, describing it as *Pterodina mucronata* Gosse;[1] he notes the resemblance in the structure of the ovary to Kirkman's animal.

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[1] Compare Powers, A case of polymorphism in Asplanchna simulating a mutation. Amer. Nat., New York, vol. 46, 1912, pp. 441-462, 526-552.

[2] Kirkman, Th., List of some of the Rotifera of Natal. Journ. Royal Micr. Soc., 1901, pp. 229-241, pl. 6.

### TESTUDINELLA PATINA (Hermann).

*Pterodina patina* EHRENBERG, Abh. Akad. Wiss. Berlin, 1830, p. 48.

In a collection from the railroad bridge over Black Swamp (1), rare; creek flowing into Camacho Reservoir (3), rare; stagnant pool at Empire (4), few.

### PEDALIA MIRA (Hudson).

*Pedalion mira* HUDSON, Monthly Micr. Journ., vol. 6, 1871, p. 121, pl. 94, figs. 1–4.

Abundant in Gatun Lake; Rio Grande Reservoir (5), rare; Carabali (Gorgona) Reservoir, rare; pond at Miraflores, back water of Rio Camitillo (12), common.

### FILINIA LONGISETA (Ehrenberg).

*Triarthra longiseta* EHRENBERG, Abh. Akad. Wiss. Berlin (for 1833), 1834, p. 222, pl. 8, fig. 1.

In Gatun Lake, few; back water of Rio Chagres at Las Bocas del Gatun, few; bayou of French Canal about 2 miles south of Gatun, few.

### FLOSCULARIA RINGENS (Linnaeus).

*Melicerta ringens* SCHRANK, Fauna Boica, vol. 3, pt. 2, 1803, p. 310.

From Rio Trinidad, above Agua Clara (10), few.

### LIMNIAS CERATOPHYLLI Schrank.

Among weeds in Rio Trinidad, at Escoval (11), few.

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[1] Daday, E. von, Süsswasser-Mikrofauna Paraguays, 1905, p. 116, pl. 6, fig. 20.

### PTYGURA LONGIPES (Wills).

*Oecistes umbella* HUDSON, Journ. Royal Micr. Soc., 1879, p. 1, pl. 1.

From Rio Trinidad, above Agua Clara (10), few.

### PTYGURA PECTINIFER (Murray).

*Oecistes pectinifer* MURRAY, Journ. Royal Micr. Soc., 1913, p. 241, pl. 10, fig. 14.

A single fully extended and numerous partially or completely contracted specimens from Rio Trinidad, above Agua Clara (10).

### SINANTHERINA SPINOSA (Thorpe).

*Megalotrocha spinosa* THORPE, Journ. Royal Micr. Soc., 1893, p. 151, pl. 3, fig. 6.

From a stagnant pool by the railroad, north of bridge over Black Swamp, rare; pool near railroad, between Black Swamp and Gatun (2), few.

### CONOCHILUS HIPPOCREPIS (Schrank).

*Conochilus volvox* EHRENBERG, Abh. Akad. Wiss. Berlin (for 1833), 1834, p. 224.

In a collection from railroad bridge over Black Swamp (1), few; pond west of Rio Chagres at Bohio (7), few.

### COLLOTHECA POLYPHEMA, new species.

Plate 17, fig. 4.

The body is of moderate length and nearly cylindrical; it tapers gradually to the short foot and passes without noticeable constriction into the corona, which has five short, blunt lobes, the dorsal being a little longer than the others. The setae are confined to the tips of the lobes. At the base of the dorsal lobe is a large, rectangular eyespot, apparently formed by the fusion of the usual two, being twice as broad as it is long; occasionally a trace of a dividing line appears to exist. The internal organs are normal, with the exception of two round, thin, disklike glandular bodies at the base of the corona, not far apart and well toward the dorsal side. Their nature and functions are unknown; it is possible that they may be the subcerebral glands, but it should be noted that no trace of these has been found in any other species of the genus. Intra-vitam staining has not been tried. The jelly-case is, as usual in free-swimming Collothecidae, attached to the foot by a fairly long, hardened cement-thread, corresponding to the peduncle of the sessile forms. The resting egg is shown in the figure; the yolk-mass is covered with numerous, close-set conical projections, which are surrounded by the outer shell.

Total length, 240 $\mu$.

*Type.*—Cat. No. 16588, U.S.N.M., from Kenilworth, District of Columbia, where the species is at times abundant. It has been found also in ponds at Lakeland, Maryland, and at Fourmile Run, Virginia. It was found in Isthmian collections, narcotized according to the de Beauchamp method, from a pond at Bohio (7), common; Rio

Grande Reservoir (5), common. The description and notes are based on local material.

This species forms a strange connecting link between the sessile and the previously described free-swimming species of the genus, which all have vibratile cilia on the corona, while this has rigid setae like the sessile forms. Its mode of locomotion is as surprising as it is unique. When the animal is fully extended, as in the figure, and a change of location is decided upon, the corona is spread out as far as possible, and, using it as a "floating anchor," the foot is contracted with a sudden jerk; the corona is then rapidly folded and shot forward by extending the foot to its utmost limits, the jelly-case now acting as anchor. The corona is then unfolded and the same laborious cycle repeated again and again, until the point of destination is reached.

It is evident that this species is much more closely related to the sessile than to the free-swimming forms and it also appears to unite these two sections of the genus into an inseparable whole.

### ROTARIA NEPTUNIA (Ehrenberg).

*Actinurus neptunius* EHRENBERG, Abh. Akad. Wiss. Berlin (for 1831), 1832, p. 145, pl. 4, fig. 23.

From a sluggish stream in savannas between Panama and Old Panama, few; pond at Miraflores, back water of Rio Camitillo (12), rare.

Contracted Bdelloids occurred in nearly all the collections; only those species are listed, which may be recognized by some structural peculiarity even in the contracted state.

### ROTARIA MACRURA (Ehrenberg).

*Rotifer macrurus* EHRENBERG, Abh. Akad. Wiss. Berlin (for 1831), 1832, p. 145, pl. 4, fig. 22.

Among algae on the rocks in a stream flowing into Gatun Reservoir, common.

### DISSOTROCHA MACROSTYLA (Ehrenberg).

*Philodina macrostyla* EHRENBERG, Infusionsth., 1838, p. 500, pl. 61, fig. 7.

In a pool near the railroad, between Black Swamp and Gatun (2), few; stagnant pool at Empire (4), few.

## NOTES ON DISTRIBUTION.

To facilitate comparison and especially on account of its bearing on the origin of the as yet unrecorded rotatorian fauna of Gatun Lake in its present extent, the following list of the collections from the more important localities, arranged with reference to the Continental Divide, will be of interest.

## ATLANTIC WATERSHED.

### From the Railroad Bridge over Black Swamp (1).

*Notommata copeus.*
*Brachionus mirabilis.*
*Platyias quadricornis.*
*Mytilina trigona.*
*Euchlanis triquetra* (?).
*Dipleuchlanis propatula.*
*Lecane curvicornis.*
*Lecane leontina.*
*Testudinella trilobata* (?).
*Testudinella patina.*
*Conochilus hippocrepis.*

### Pool near the Railroad, between Black Swamp and Gatun (2).

*Notommata pseudocerberus.*
*Pleurotrocha sordida.*
*Monommata orbis.*
*Dicranophorus forcipatus.*
*Platyias quadricornis.*
*Mytilina ventralis.*
*Euchlanis dilatata.*
*Euchlanis plicata.*
*Lecane aeganea.*
*Lecane arcula.*
*Lecane compta.*
*Lecane crepida.*
*Lecane doryssa.*
*Lecane ercodes.*
*Lecane hornemanni.*
*Lecane leontina.*
*Lecane luna.*
*Lecane nana.*
*Lecane ploenensis.*
*Lecane ungulata.*
*Monostyla bulla.*
*Monostyla closterocerca.*
*Monostyla cornuta.*
*Monostyla decipiens.*
*Monostyla furcata.*
*Monostyla pyriformis.*
*Monostyla rugosa.*
*Monostyla virga.*
*Lepadella cyrtopus.*
*Trichotria tetratis.*
*Macrochaetus collinsii.*
*Sinantherina spinosa.*
*Dissotrocha macrostyla.*

### Gatun Lake.

*Brachionus angularis caudatus.*
*Brachionus capsuliflorus* (*bakeri*).
*Brachionus falcatus.*
*Brachionus patulus macracanthus.*
*Keratella stipitata.*
*Monostyla bulla.*
*Polyarthra trigla.*
*Pedalia mira.*
*Filinia longiseta.*
*Asplanchna brightwellii.*

### Rio Trinidad, about 1 mile from mouth (9).

*Dicranophorus forcipatus.*
*Lecane arcula.*
*Lecane ploenensis.*
*Monostyla cornuta.*
*Monostyla furcata.*
*Monostyla pyriformis.*

### Rio Trinidad, above Agua Clara (10).

*Notommata pseudocerberus.*
*Diaschiza forficata.*
*Diaschiza auriculata.*
*Mytilina ventralis.*
*Lecane arcula.*
*Lecane compta.*
*Lecane hornemanni.*
*Monostyla bulla.*
*Monostyla closterocerca.*
*Monostyla cornuta.*
*Monostyla furcata.*
*Monostyla hamata.*
*Monostyla obtusa.*
*Monostyla pyriformis.*
*Monostyla quadridentata.*
*Monostyla rugosa.*
*Monostyla virga.*
*Lepadella solidus.*
*Trichotria tetractis.*
*Scaridium longicaudum.*
*Testudinella incisa.*
*Floscularia ringens.*
*Ptygura longipes.*
*Ptygura pectinifer.*

### Rio Trinidad, at Escoval (11).

*Diaschiza forficata.*
*Monommata longiseta.*
*Euchlanis dilatata.*
*Euchlanis oropha.*
*Lecane amorpha.*
*Lecane arcula.*
*Lecane ludwigii.*
*Lecane papuana.*
*Monostyla closterocerca.*
*Monostyla cornuta.*
*Monostyla decipiens.*
*Monostyla hamata.*
*Monostyla virga.*
*Lepadella imbricata.*
*Lepadella patella.*
*Trichocerca bicristata.*
*Trichocerca nitida.*
*Diurella brachyura.*
*Diurella stylata.*
*Diurella tenuior.*
*Polyarthra trigla.*
*Limnias ceratophylli.*

### Creek flowing into Camacho Reservoir (3).

*Notommata cerberus.*
*Diaschiza forficata.*
*Diaschiza gibba.*
*Diaschiza gracilis.*
*Monommata orbis.*
*Dicranophorus forcipatus.*
*Brachionus patulus macracanthus.*
*Keratella quadrata.*
*Keratella stipitata.*
*Euchlanis oropha.*
*Dipleuchlanis propatula.*
*Lecane arcula.*
*Lecane crepida.*
*Lecane flexilis.*
*Lecane hornemanni.*
*Lecane leontina.*
*Lecane ludwigii.*
*Lecane luna.*
*Lecane ploenensis.*
*Lecane tenuiseta.*
*Monostyla bifurca.*
*Monostyla bulla.*
*Monostyla closterocerca.*
*Monostyla cornuta.*
*Monostyla decipiens.*
*Monostyla furcata.*
*Monostyla hamata.*
*Monostyla lunaris.*
*Monostyla pyriformis.*
*Lepadella cyrtopus.*
*Lepadella solidus.*
*Colurella bicuspidata.*
*Colurella uncinata.*
*Squatinella mutica.*
*Macrochaetus collinsii.*
*Scaridium longicaudum.*
*Diurella brachyura.*
*Diurella tigris.*
*Diurella weberi.*
*Testudinella incisa.*
*Testudinella patina.*

### Carabali (Gorgona) Reservoir).

*Brachionus angularis caudatus.*
*Brachionus budapestinensis.*
*Anuraeopsis fissa.*
*Diurella stylata.*
*Polyarthra trigla.*
*Pedalia mira.*

### Pond west of Rio Chagres at Bohio (7).

*Brachionus dolabratus.*
*Brachionus angularis caudatus.*
*Brachionus patulus macracanthus.*
*Keratella stipitata.*
*Notholca longispina.*
*Monostyla virga.*
*Trichocerca nitida.*
*Diurella brachyura.*
*Conochilus hippocrepis.*
*Collotheca polyphema.*

### Pond east of canal at Empire (8).

*Lecane leontina.*
*Lecane ludwigii.*
*Lecane ploenensis.*
*Monostyla bulla.*
*Monostyla cornuta.*
*Monostyla virga.*
*Scaridium eudactylotum.*
*Trichocerca bicristata.*
*Diurella tigris.*

### Stagnant pool at the end of Canal cut, Empire (4).

*Dicranophorus forcipatus.*
*Encentrum felis.*
*Brachionus patulus.*
*Brachionus patulus macracanthus.*
*Keratella stipitata.*
*Mytilina trigona.*
*Euchlanis dilatata.*
*Euchlanis plicata.*
*Dipleuchlanis propatula.*
*Lecane arcula.*
*Lecane compta.*
*Lecane crepida.*
*Lecane curvicornis.*
*Lecane flexilis.*
*Lecane leontina.*
*Lecane luna.*
*Lecane marshi.*
*Lecane papuana.*
*Lecane ploenensis.*
*Lecane pusilla.*
*Lecane sibina.*
*Monostyla bulla.*
*Monostyla cornuta.*
*Monostyla furcata.*
*Monostyla hamata.*
*Monostyla obtusa.*
*Monostyla pyriformis.*
*Monostyla quadridentata.*
*Lepadella cyrtopus.*
*Lepadella imbricata.*
*Colurella uncinata.*
*Macrochaetus collinsii.*
*Scaridium longicaudum.*
*Trichocerca pusilla.*
*Testudinella patina.*
*Dissotrocha macrostyla.*

## PACIFIC WATERSHED.

### Pond at Miraflores; back water of Rio Camitillo (12).

*Notommata aurita.*
*Brachionus angularis caudatus.*
*Brachionus capsuliflorus (bakeri).*
*Brachionus patulus macracanthus.*
*Platyias quadricornis.*
*Keratella stipitata.*
*Euchlanis dilatata.*
*Dipleuchlanis propatula.*
*Lecane papuana.*
*Trichocerca pusilla.*
*Trichocerca rattus.*
*Diurella dixon-nuttalli.*
*Diurella stylata.*
*Polyarthra trigla.*
*Pedalia mira.*
*Rotaria neptunia.*

### Rio Grande, river (6).

*Dicranophorus forcipatus.*
*Brachionus capsuliflorus (bakeri).*
*Brachionus patulus macracanthus.*
*Keratella stipitata.*
*Mytilina ventralis.*
*Euchlanis dilatata.*
*Dipleuchlanis propatula.*
*Lecane arcula.*
*Lecane crepida.*
*Lecane curvicornis.*
*Lecane hornemanni.*
*Lecane papuana.*
*Lecane pusilla.*
*Monostyla bulla.*
*Monostyla cornuta.*
*Monostyla furcata.*
*Monostyla pyriformis.*
*Monostyla rugosa.*
*Lepadella cyrtopus.*
*Lepadella triptera.*
*Colurella uncinata.*
*Macrochaetus collinsii.*
*Diurella tigris.*
*Diurella weberi.*

### Rio Grande Reservoir, near railroad bridge (5).

*Dicranophorus forcipatus.*
*Brachionus capsuliflorus (bakeri).*
*Keratella stipitata.*
*Anuraeopsis fissa.*
*Mytilina ventralis.*
*Euchlanis plicata.*
*Dipleuchlanis propatula.*
*Lecane arcula.*
*Lecane crepida.*
*Lecane curvicornis.*

*Lecane elegans.*
*Lecane hornemanni.*
*Lecane papuana.*
*Monostyla bulla.*
*Monostyla closterocerca.*
*Monostyla cornuta.*
*Monostyla decipiens.*
*Monostyla hamata.*
*Monostyla lunaris.*
*Monostyla obtusa.*
*Monostyla pyriformis.*
*Monostyla quadridentata.*
*Monostyla rugosa.*
*Monostyla virga.*
*Lepadella cyrtopus.*
*Lepadella triptera.*
*Colurella bicuspidata.*
*Colurella uncinata.*
*Trichocerca pusilla.*
*Trichocerca rattus.*
*Diurella stylata.*
*Diurella tigris.*
*Diurella voluta.*
*Polyarthra trigla.*
*Pedalia mira.*
*Collotheca polyphema.*

Of the 109 species and distinct varieties recorded, 46 are common to the Atlantic and Pacific slopes, 55 occur only on the Atlantic, and 8 only on the Pacific slope. This group of 63 species includes but 20 occurring in sufficient numbers to be termed common—16 Atlantic and 4 Pacific species. It is questionable whether these figures demonstrate anything beyond the already known lack of suitable environments on the Pacific slope.

The closely related genera *Lecane* and *Monostyla* exhibit some interesting anomalies of distribution. Of the 13 species of *Monostyla*, 12 are common to the Atlantic and Pacific slopes; *Lecane* is represented by 22 species, only 7 of which occur in both watersheds.

Four species of these two genera, *Lecane amorpha*, *L. flexilis*, *L. tenuiseta*, and *Monostyla bifurca*, to which may be added a fifth, *Monostyla* (= *Diarthra*) *monostyla*, found by Daday in Paraguay, occur on the Isthmus in ponds, while here at Washington they are found only in Sphagnum. This change of habitat is without any obvious explanation; the reverse would have been more intelligible. If only one species had been involved it might have been passed over, but when the same peculiar environmental relation is found to apply to five species, there must be some definite cause for it, whatever that may be.

The fauna of Gatun Lake at the time the collections were made was practically a normal pond fauna, as demonstrated by comparison with similar localities on the Isthmus. Rio Trinidad, in the region represented, was virtually stagnant. It is surprising to find so few species common to these two connected bodies of water. The lake fauna would be expected to be transplanted from Rio Trinidad; evidently this did not occur, and its origin must have been in the small ponds which existed in the territory before the construction of the lake and were gradually engulfed.

If the Isthmian list is compared with Murray's of the collections made by him in Chile, Argentina, and Brazil, a sufficiently close agreement will be found to warrant the conclusion that the rotatorian fauna of the Isthmus is South American. This is merely corroborative of the reports on other groups, which have established the agreement of the Isthmian fauna in general with that of South America.

The two lists record a total of 138 species, of which 35 are limited to South and Central America. As both lists are fragmentary by reason of the nearly complete absence of the illoricate species, a more accurate judgment may be arrived at by a study of the genera *Lecane* and *Monostyla*, in which all the species are recognizable, even when contracted. A total of 43 species belonging to these two genera occur in the combined lists, 21 of which are not known outside of the South American faunal region and 26 species are known only from the American continent. Naturally both Murray's and this list have their quota of rare species, but many of the exclusively South American species are abundant, such as *Lecane arcula*, *L. compta*, *L. crepida*, *L. curvicornis*, *L. nana*, *L. pusilla*, *Monostyla decipiens*, *M. furcata*, *M. pyriformis*, *M. rugosa*, and *M. virga*. No doubt some of these will eventually be found elsewhere, but on the other hand it is at least equally probable that many more undescribed species exist in South America, in view of the limited territory represented by the collections, and the conclusion that it is entirely proper to speak of a distinctly South American rotatorian fauna seems therefore irresistible.

The localization of so many species of Rotatoria should go far to disprove the importance of birds as agents of dissemination. No one will of course deny that birds do influence distribution to some extent, but it is extremely doubtful whether it amounts to more than equalizing the fauna of circumscribed localities. That any long-distance transmission takes place is a purely gratuitous assumption; it is rendered highly improbable, if not actually disproved, by the diversity of the rotatorian faunas of North and South America. It is well known that our migratory birds winter on the shores of the Caribbean and countless millions make the trip every year, so that the rotatorian fauna of America from the Equator to the Arctic Circle should be sensibly uniform, if birds were even accidental carriers. The indicated great diversity of the North and South American faunas flatly contradicts this.

While it has been frequently claimed that the Rotatoria are distributed all over the world with something approaching monotonous uniformity, the evidence upon which this assertion is based appears entirely too fragmentary to draw any such far-reaching conclusions from. And it would be necessary to bring forward irrefutable evidence, as a uniform, cosmopolitan distribution is unknown in any other subdivision of the animal world. It seems particularly out of place in the case of the Rotatoria, as it is in direct opposition to the better known facts of the distribution of the Entomostraca, which as far as we know ought to be sensibly parallel, at least the adaptation to and means for distribution are identical in both cases. It has long ago been demonstrated that some Entomostraca are cosmopolitan, while many are more or less localized, and there is every reason to believe that the same holds good for the Rotatoria. A majority of the species are, upon the basis of our present knowledge, limited to particular localities. That this localization may be in some cases only apparent is obvious; there is no doubt that many animals now considered rare will eventually be shown to have a wide distribution. But it should be evident that, if we begin by assuming universal distribution, it is unlikely that anything will be discovered to disprove it, not only because it is not searched for, but also on account of no attempt being made to correlate the acquired evidence.

That many species of Rotatoria undoubtedly do enjoy a world-wide distribution is certain. This is not surprising, considering the great age of this group, which, even if not demonstrated by paleontological evidence, may reasonably be inferred from the well known fact that the origin of Arthropods dates back to the unrecorded interval between the Archaean and Paleozoic eras; that all the major divisions of the lower Invertebrates originated long before the appearance of the Arthropods is now universally accepted, and on this basis it is not difficult to account for the extensive distribution of many species of Rotatoria. In this connection it may not be out of place to call attention to the fact that the earliest known bird, *Archaeopteryx*, is of Jurassic age, so that if the Rotatoria had been dependent on distribution by birds, they would have become extinct ages before dispersal could have occurred. It is also quite possible that bird migrations may be of comparatively recent origin.

For the reasons given, it would seem that the universal distribution theory is at least unsafe as a working hypothesis, if not actually harmful. A careful study of the rotatorian fauna of any locality whatever is still worth while, until we have far more complete records than we now possess. Systematic work, including faunal lists, may not be the most satisfying to the investigator, but both are the foundation upon which the whole structure must be erected.

One of the consequent drawbacks of the universal distribution theory is that many forms without doubt remain unrecorded, if showing a certain resemblance to some known species. As partly responsible for this one may also consider the imprecations so often hurled at the head of the unfortunate who happens to give a new name to an old species, surely a minor offense, provided the description and figure are both good. It is very much easier to relegate a name to synonymy than to sift out a number of species traveling under the same name, and if merely listed without description and figure it is obviously impossible to determine the identity of the animal which the observer had before him.

The crying need of rotatorian taxonomy is at present exact and full descriptions of all the known species. Too much stress can not be laid upon complete descriptions. It is not sufficient to differentiate the species from all others known to-day. It is quite evident that we know as yet only a small fraction of the total number of species of Rotatoria extant, consequently a description (and figure) should record all that can be ascertained in order to enable the future discoverer of a closely related animal to decide whether his specimen belongs to an old species or is really an undescribed form. This should not be construed as disparaging comparisons with known species. These are very useful, but should be only accessory. Our main dependence must be a detailed and full description. By description is to be understood not merely the word picture, but also the figure, which in the absence of a fixed terminology is absolutely necessary. It is indeed doubtful whether combinations of words will ever be sufficient to differentiate Rotatoria without being supplemented by an illustration.

## EXPLANATION OF PLATES.

All figures are highly magnified. For actual measurements see text.

### Plate 16.

Fig. 1. *Brachionus dolabratus*, ventral view; page 529.
2. *Brachionus dolabratus*, lateral view.
3. *Lepadella imbricata*, ventral view; page 549.
4. *Lepadella imbricata*, lateral view.
5. *Lepadella imbricata*, cross section of body.
6. *Lepadella cyrtopus*, ventral view; page 550.
7. *Lepadella cyrtopus*, lateral view.
8. *Lepadella cyrtopus*, cross section of body.

### Plate 17.

Fig. 1. *Brachionus patulus macracanthus*, dorsal view; page 530.
2. *Trichocerca nitida*, lateral view; page 551.
3. *Lecane curvicornis*, lateral view; page 535.
4. *Collotheca polyphema*, lateral view; page 555.

### Plate 18.

Fig. 1. *Lecane marshi*, ventral view; page 537.
2. *Lecane marshi*, lateral view.
3. *Lecane marshi*, dorsal view.
4. *Lecane ercodes*, ventral view; page 537.
5. *Lecane ercodes*, lateral view.
6. *Lecane ercodes*, dorsal view.

### Plate 19.

Fig. 1. *Lecane flexilis*, ventral view; page 538.
2. *Lecane flexilis*, lateral view.
3. *Lecane flexilis*, dorsal view.
4. *Lecane arcula*, ventral view; page 539.
5. *Lecane arcula*, lateral view.
6. *Lecane arcula*, dorsal view.

### PLATE 20.

Fig. 1. *Lecane compta*, ventral view; page 540.
2. *Lecane compta*, lateral view.
3. *Lecane compta*, dorsal view.
4. *Lecane pusilla*, ventral view; page 541.
5. *Lecane pusilla*, lateral view.
6. *Lecane pusilla*, dorsal view.

### PLATE 21.

Fig. 1. *Lecane aeganea*, ventral view; page 542.
2. *Lecane aeganea*, lateral view.
3. *Lecane aeganea*, dorsal view.
4. *Lecane doryssa*, ventral view; page 542.
5. *Lecane doryssa*, lateral view.
6. *Lecane doryssa*, dorsal view.

### PLATE 22.

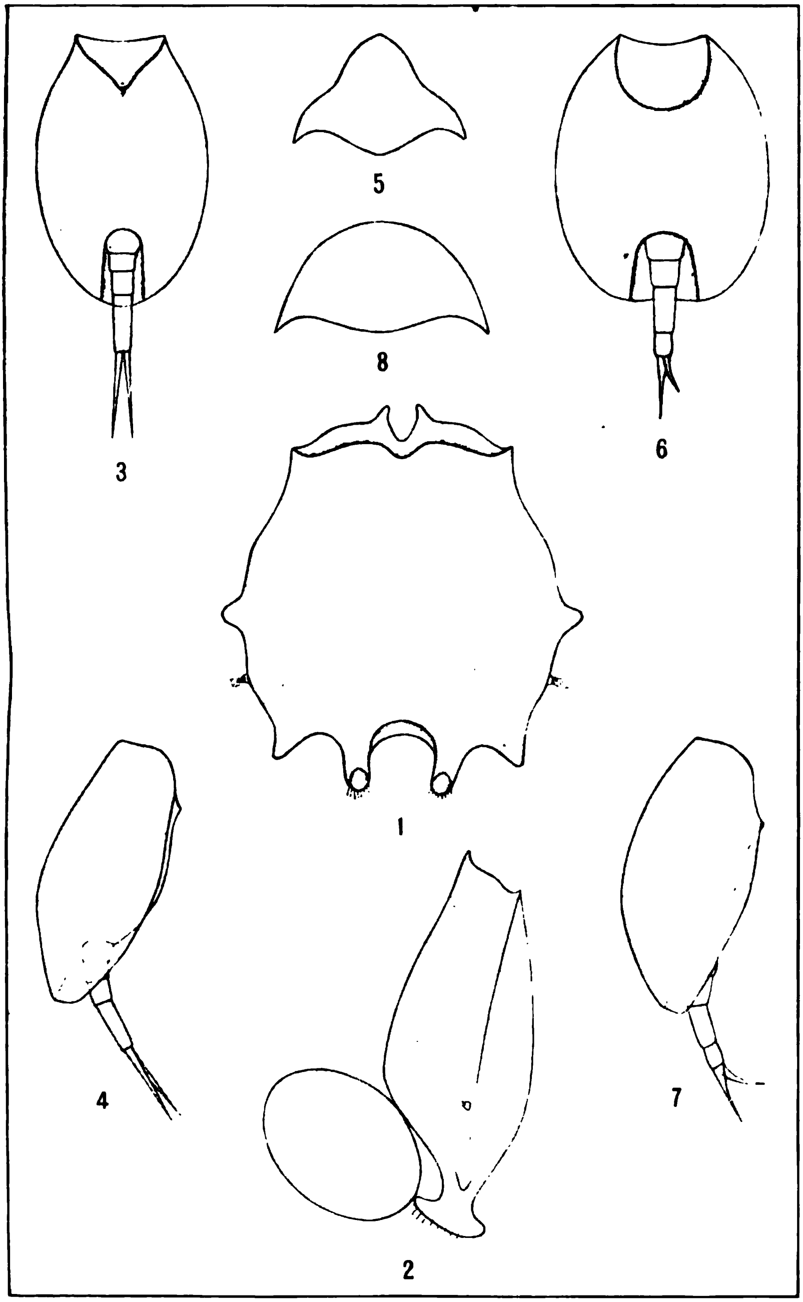
Fig. 1. *Lecane tenuiseta*, ventral view; page 543.
2. *Lecane tenuiseta*, lateral view.
3. *Lecane tenuiseta*, dorsal view.
4. *Lecane crepida*, ventral view; page 533.
5. *Lecane crepida*, lateral view.
6. *Lecane crepida*, dorsal view.
7. *Lecane crepida*, cross section of body.

### PLATE 23.

Fig. 1. *Lecane amorpha*, ventral view; page 544.
2. *Lecane amorpha*, lateral view.
3. *Lecane elegans*, ventral view; page 544.
4. *Lecane elegans*, lateral view.
5. *Lecane sibina*, ventral view; page 535.
6. *Lecane sibina*, lateral view.
7. *Lecane sibina*, dorsal view.

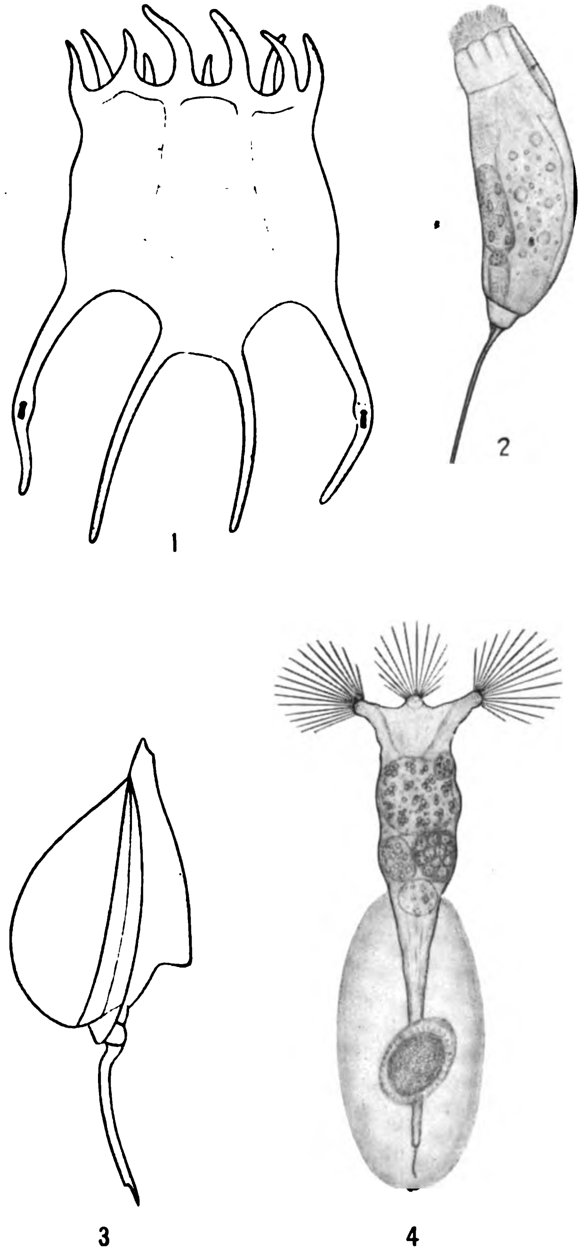
### PLATE 24.

Fig. 1. *Monostyla virga*, ventral view; page 546.
2. *Monostyla virga*, lateral view.
3. *Monostyla virga*, dorsal view.
4. *Monostyla rugosa*, ventral view; page 548.
5. *Monostyla rugosa*, lateral view.
6. *Monostyla rugosa*, dorsal view.



NEW ROTATORIA FROM PANAMA.

FOR EXPLANATION OF PLATE SEE PAGE 563.



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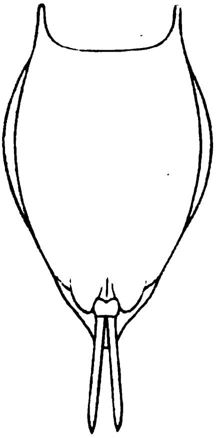
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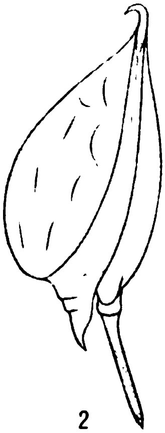
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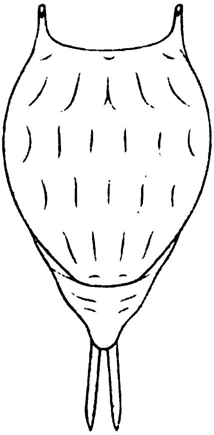
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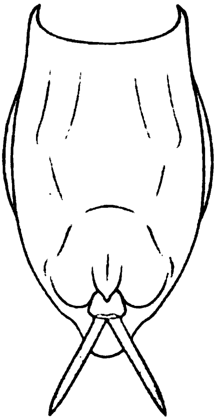
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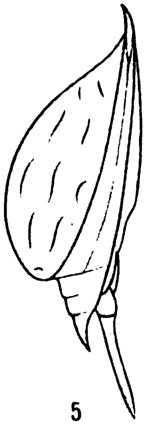
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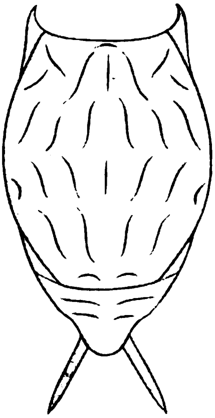
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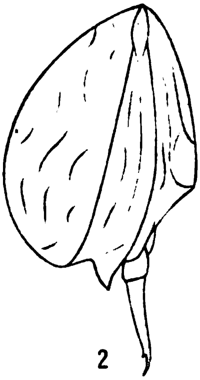
New Rotatoria from Panama.

For explanation of plate see page 563.



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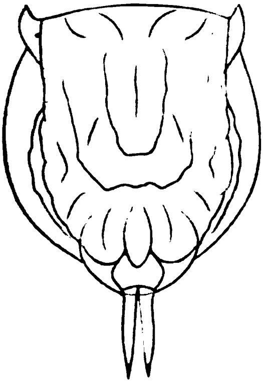

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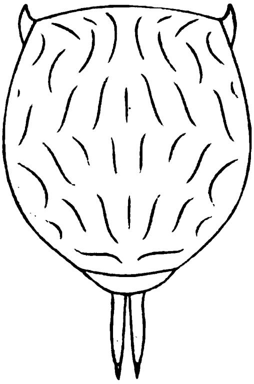

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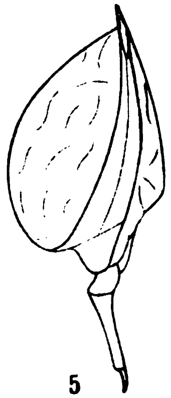

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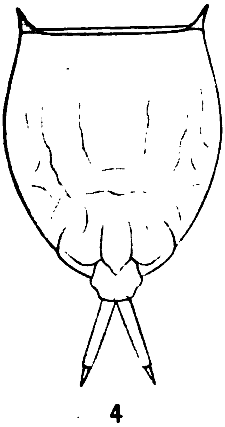

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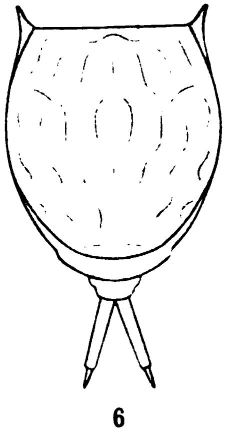

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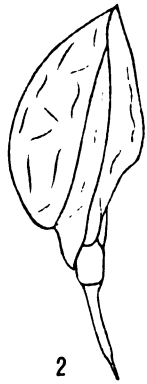
NEW ROTATORIA FROM PANAMA.

FOR EXPLANATION OF PLATE SEE PAGE 563.



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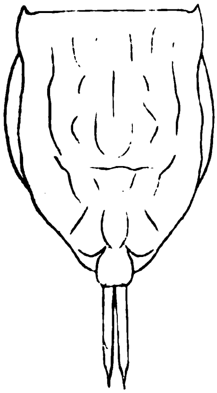

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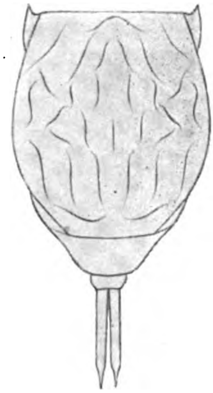

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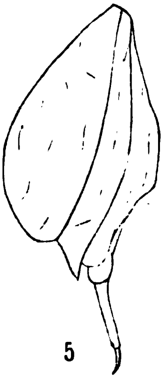

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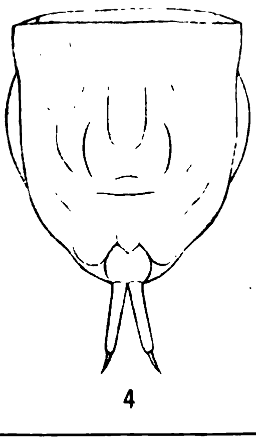

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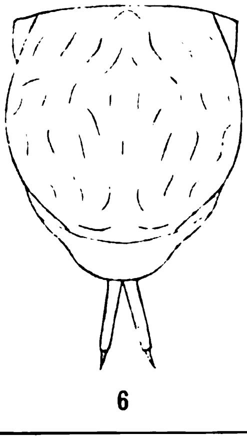

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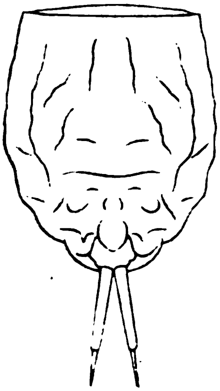
New Rotatoria from Panama.

For explanation of plate see page 564.



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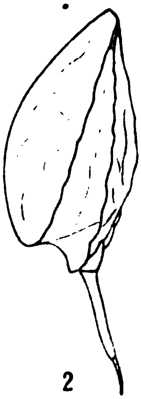

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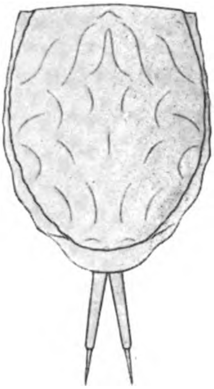

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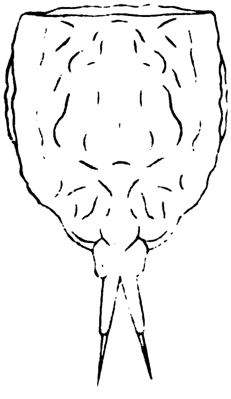

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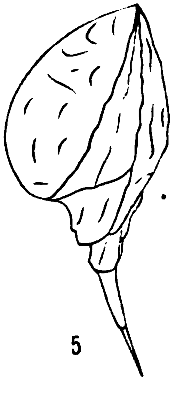

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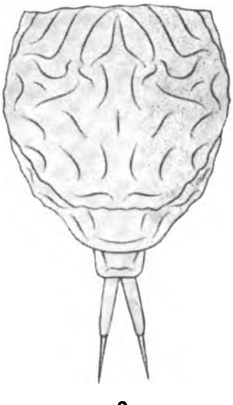

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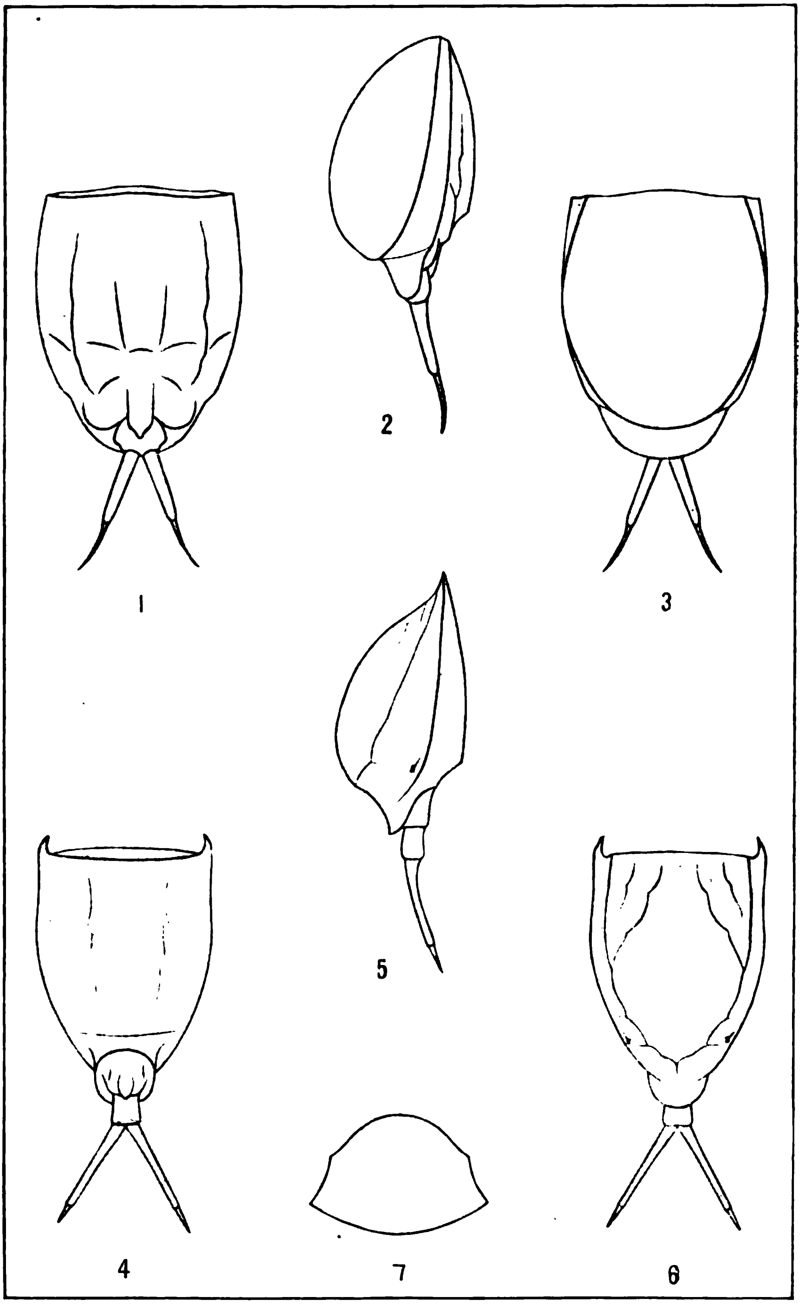
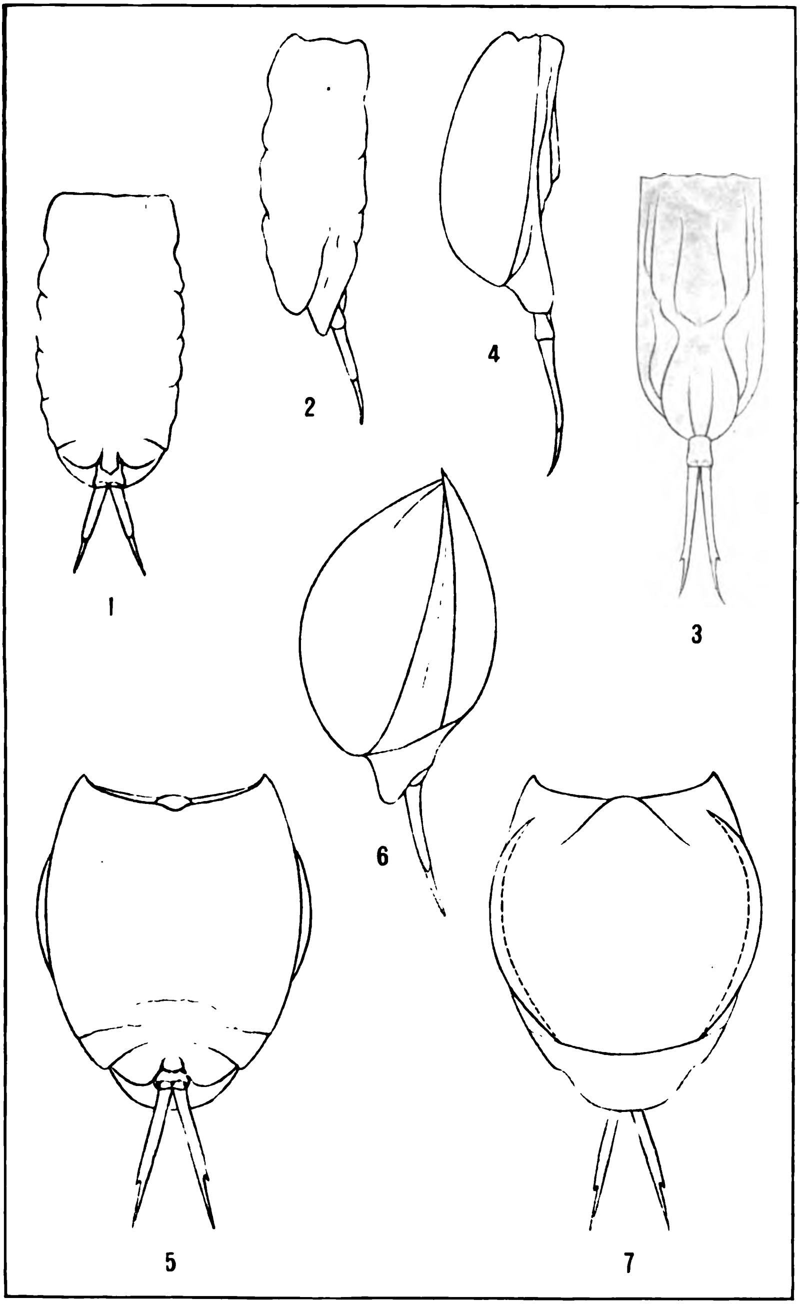
New Rotatoria from Panama.

For explanation of plate see page 564.



NEW ROTATORIA FROM PANAMA.

FOR EXPLANATION OF PLATE SEE PAGE 564.



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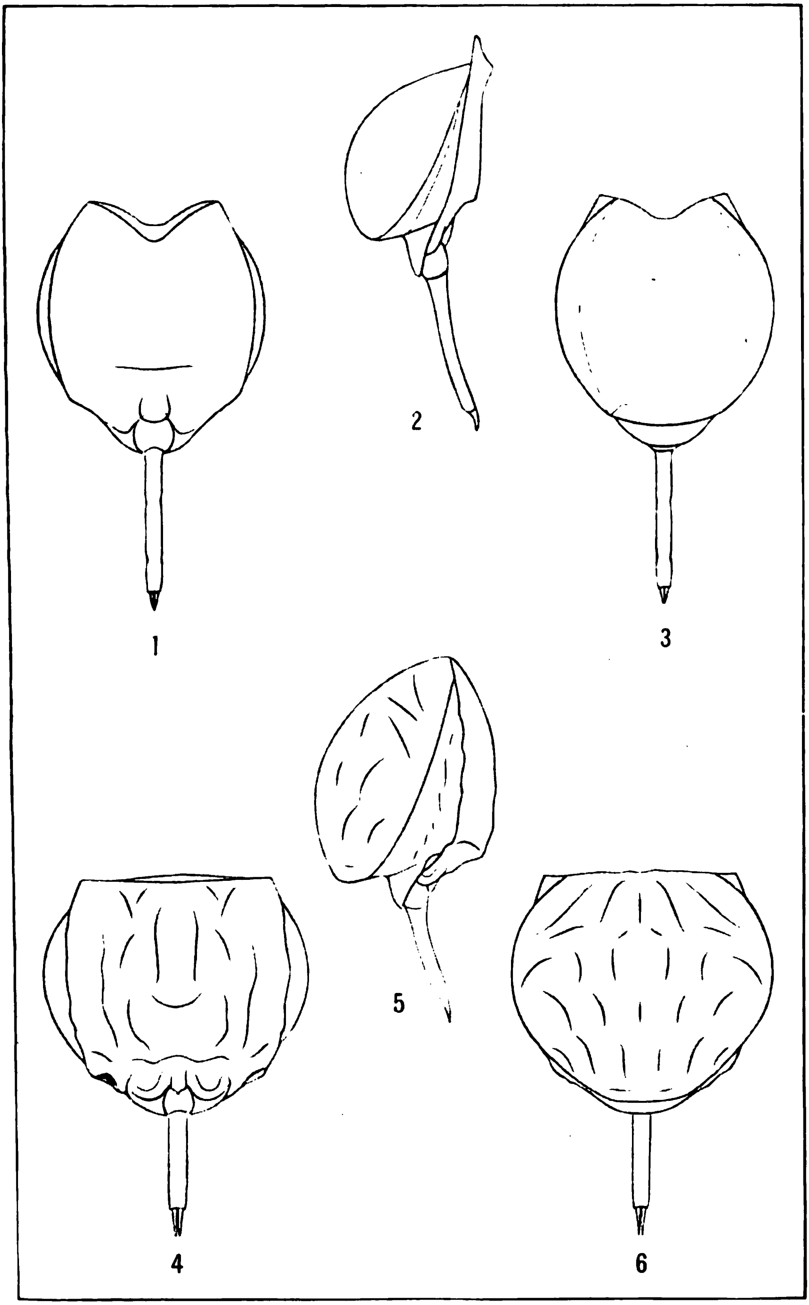
FOR EXPLANATION OF PLATE SEE PAGE 564.



New Rotatoria from Panama.

For explanation of plate see page 564.

# NORTH AMERICAN PARASITIC COPEPODS BELONGING TO THE LERNAEOPODIDAE, WITH A REVISION OF THE ENTIRE FAMILY.

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## INTRODUCTION.

The present is the eleventh[1] paper in the series based on the collection of parasitic copepods in the United States National Museum and deals with the family Lernaeopodidae.

For several reasons the necessity of supplemental study has been greater than in connection with any of the families previously treated. The Lernaeopodidae are soft-bodied, without any chitin framework, external or internal, to hold them in shape. Consequently they shrink and often become so distorted during preservation that the museum specimen gives very little idea of the original. Most of the species are transparent when alive, and much of their internal anatomy can then be plainly seen. But in a preservative they become opaque and require dissecting or sectioning before anything can be learned with regard to their internal structure.

Finally a knowledge of both sexes of the various genera, and of the developmental stages through which the larvae pass has been found necessary for the establishment of a rational basis of classification. And the greater bulk of such information must be obtained outside of a museum collection.

The development of the family was worked out at Lake Maxinkuckee, Indiana, during the summers of 1906, 1908, and 1909, and has already been published as the ninth paper of the present series.

Isolated developmental stages and the males of many species were obtained at Beaufort, North Carolina, while working for the United

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[1] The ten preceding papers, all of which were published in the Proceedings of the United States National Museum, are: 1. The Argulidae, vol. 25, pp. 635–742, pls. 8–27. 2. Descriptions of Argulidae, vol. 27, pp. 627–655, 38 text-figures. 3. The Calliginae, vol. 28, pp. 479–672, pls. 5–29. 4. The Trebinae and Euryphorinae, vol. 31, pp. 669–720, pls. 15–20. 5. Additional notes on the Argulidae, vol. 32, pp. 411–424, pls. 29–32. 6. The Pandarinae and Cecropinae, vol. 83, pp. 323–490, pls. 17–43. 7. New Species of Caliginae, vol. 33, pp. 593–627, pls. 49–56. 8. Parasitic Copepods from the Pacific Coast, vol. 35, pp. 431–481, pls. 66–83. 9. Development of *Achtheres ambloplitis* Kellicott, vol. 39, pp. 189–226, pls. 29–36. 10. The Ergasilidae, vol. 39, pp. 263–400, pls. 41–60.

Proceedings U. S. National Museum, Vol. 47—No. 2063.

States Bureau of Fisheries. For these excellent advantages the author is indebted to the courtesy of the Hon. George M. Bowers, former United States Commissioner of Fisheries.

The internal anatomy has been derived partly from the study of living specimens at each of the above localities, and partly from serial sections made in the laboratory of Johns Hopkins University, as noted in the ninth paper above mentioned.

A number of specimens, including several of the new species, were collected by Dr. Edwin Linton during his investigations on the cestode and trematode parasites of fishes, and were generously turned over by him to the present author. These specimens are always excellently preserved and have proved of great value in the present study.

Several years ago Dr. R. R. Gurley, at that time in the employ of the United States Bureau of Fisheries, collected in manuscript form all the available data regarding copepods parasitic upon our North American freshwater fishes. These notes have been placed at the author's disposal, and as they included complete translations of everything written on North American species by foreign authors they have proved extremely valuable. Acknowledgment is made in the text whenever these notes have been incorporated.

Dr. Nathan Fasten, of the Department of Zoology at the University of Wisconsin, has recently published three excellent papers on the habits and development of a species of this family which infests the common brook trout. At the author's request Dr. Fasten very kindly loaned mounted specimens of the copepodid larvae and male of this species, *Salmincola edwardsii*, which have been of much use for study and comparison.

As here constituted the family includes 23 genera and 136 species, of which 12 genera and 21 species are new to science.

In addition there are several other genera and species which at one time or another have been included in this family, but which must be regarded as synonyms or as not sufficiently well established to be definitely located.

## ECOLOGY.

Wherever the Lernaeopodidae may be placed in any scheme of classification, all authors will agree that they are fixed parasites and extremely degenerate. Consequently we should look for marked sexual dimorphism, a partial or total loss of the powers of locomotion, and a corresponding complexity in the means of prehension. And we find these abundantly exemplified.

*Sexual dimorphism.*—The differences between the sexes manifest themselves not only in an enormous disparity in size, coupled with a corresponding dissimilarity in the structure of the body and its appendages, but also in the methods and extent of prehension and locomotion. Such dimorphism as has to do with structure will be treated under morphology (see p. 571), while that which concerns locomotion and prehension follows under those headings respectively.

*Locomotion.*—The larvae alone in this family possess the ability to swim about freely and that only for a remarkably short period, during which they must seek out a host and attach themselves to it. During this free stage the larva swims about actively with a jerky spiral motion by means of its two pairs of swimming legs. Fasten in his experiments with the brook trout parasite, *Salmincola edwardsii*, found that the average distance covered by a single contraction of the swimming legs was about an inch. When the motion ceased the larva at first took an upright position, then turned upside down and sank to the bottom where it lay as it struck, with either the dorsal or ventral side uppermost. It was also able by means of its first antennae to cling to the side of the aquarium, or to suspend itself from the surface film of the water. By means of its peculiar spiral locomotion it is enabled to cover the maximum of territory with the minimum of muscular energy.

*Female.*—After the female larva has once become attached it can not loosen this connection and form another, but must remain in the same place all the rest of its life. If the arms (second maxillae) are short, as in many species of *Clavella*, scarcely any freedom of motion can be enjoyed. The parasite is not only fixed in position, but it can not turn or flex its body, and becomes fully as helpless as some of the Lernaeidae or Chondracanthidae, whose head and neck are buried in the flesh of their host. On the other hand, if the attachment organs are long and slender as in many species of *Brachiella*, *Lernaeopodina*, etc., while the tips of these arms remain at a fixed point the body of the parasite can describe quite an arc. The arms are supplied with powerful muscles which swing the body to one side or restore it again when once displaced. In this way the animal often escapes being brushed or scraped off from the fish, especially those species which attach theselves to the fins, where, of course, there is the greatest danger. After the female is once fastened to her host she loses during subsequent moults the two pairs of swimming legs which were all the locomotor organs she ever possessed. She finds excellent aeration for her eggs and a good position from whence to discharge the copepodid larvae when once they have matured. And there is also an abundance of food, so that she is well provided for during life.

*Male.*—The free-swimming period of the male larva is no longer than that of the female, and the two often fasten themselves side by side upon the same fish. But while this attachment is permanent in the case of the female, it is only temporary for the male.

When the two have become sexually mature the male, on swinging around upon its attachment filament and coming in contact with the body of a female, lets go of the filament and fastens himself to the female by his second maxillae and maxillipeds, and remains upon her body for the rest of his life. Not being permanently fixed, he is able to crawl about over the female's body, and is found sometimes in one position, sometimes in another. But such motion is slow amd laborious and probably is only practiced when necessary. Unlike the female the male does not always lose his swimming legs, but may retain them; they become very small and dwarfed, however, and lose all their swimming setae, so that they are no longer of any service as locomotor organs. Furthermore the male does not increase in size with successive molts like the female, but remains dwarfed, little if any larger than in its copepodid stage. The mating of the sexes in this family takes place upon reaching maturity, just after the molt at the close of the second copepodid stage. But the male may remain clinging to the body of the female long after this mating, sometimes possibly throughout the life of the latter.

*Prehension.*—The organs of prehension are the second maxillae and maxillipeds. As explained elsewhere,[1] the copepodid larvae, both male and female, seize their host with the maxillipeds, rub the frontal margin of the head against the skin of the gill arch or fin until the outer end of the attachment filament is firmly glued in place by means of the adhesive fluid it contains. As the coiled filament is drawn out of the head, or subsequently, the larva grasps its inner end between the claws at the tip of its second maxillae.

Fasten,[2] observing *Salmincola edwardsii* under the microscope, describes its attachment as follows: . . . "As soon as the copepod comes in contact with the filament of the gill its mouth parts (maxillipeds) are inserted into the flesh, and by means of the powerful claw-like second maxillae it begins to rasp the filament until it forms a cavity within it. As soon as this occurs, the anterior portion of the copepod's head, the frontal margin, is brought in contact with the cavity and the inclosed attachment filament is injected into the hole. The spherical mushroom body adheres to the flesh and the regenerating tissue of the gill soon incloses it tightly,. thereby fastening the organism firmly. The mouth parts are then withdrawn from the flesh of the gill filament. In this condition the parasite remains attached for a short time. Then the second maxillae detach the posterior region of the attachment filament from the head margin and they themselves become permanently attached to this end of the filament."

The exact time or even the method of attachment are specific or generic in significance. That which concerns us in dealing with the family is the fact that the larva is attached at the first by a frontal filament. The proximal end of this filament is afterwards transferred to the second maxillae, which thus become the organs of prehension in the adult. The hold thus secured is retained by the female throughout life, the second maxillae gradually elongating and fusing with the filament. In most of the species these organs become so long that they entirely usurp the function of prehension, and leave the maxillipeds out of commission, so far as holding the parasite on its host is concerned.

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[1] Proc. U. S. Nat. Mus., vol. 39, p. 211.

[2] Journ. Animal Behavior, vol. 3, No. 1, p. 56.

In the male such fusion does not take place, but as soon as he has found a female the second maxillae release the frontal filament and are afterwards used in a normal manner as prehensile organs along with the maxillipeds. Accordingly in the male the second maxillae retain their original musculature, which is similar to that of the maxillipeds. And the male uses these two pairs of appendages in exactly the same manner, moving about the little that it is able by employing them alternately, grasping with the maxillipeds while it reaches forward with the maxillae and obtains a new hold, then releasing and reaching forward with the maxillipeds. In this way the organs serve the double purpose of prehension and locomotion, in fact all the locomotion of which the adult males are capable.

In the female, on the contrary, the musculature of the second maxillae becomes highly modified. There is no further use for the claws, and so the muscles that would otherwise move them become atrophied. The rest of the muscles are gathered into long bands or bundles, which run the entire length of the maxilla and are strong enough to move the whole body. Such modified organs of prehension are, so far as known, peculiar to the females of the present family, and nothing like them is found in any of the other copepods. After being once attached the females are incapable of any further locomotion, even the sort practiced by the males so that neither pair of appendages can function for this purpose. If there were not some further use for the maxillipeds we should expect to find them dwarfed or degenerated, but they retain to the full their shape and powerful musculature. This is because the female uses them in procuring her food. Ordinarily her body hangs free from the host, supported solely by the second maxillae. In order to obtain requisite nourishment the head and mouth of the parasite must be drawn up to, and held in contact with, the skin of the host. This is done by means of the maxillipeds, and is fully as important a function as the one served by the second maxillae.

*Hosts.*—This family of parasites is widely distributed amongst fishes in both salt and fresh water. Some of our best food and game fish are infested with them, and when they once obtain entrance to a stock pond, fish hatchery, or aquarium they usually multiply so rapidly as to become a serious nuisance, and may even kill the fish.

Their free swimming period is, of course, the only time that their enemies can get access to them, and this period is so brief that not many of the larvae are killed.

But the brevity of this period also operates as a regulator to prevent the parasites from becoming too numerous. For unless they find a host during this period they quickly perish. The shorter the period, therefore, the fewer will be those whose search is successful. In the crowded confines of a stock pond, on the contrary, practically every larva is sure of finding a host. And all too often the gills of the fish become so crowded with parasites that they can not perform their normal functions, and the fish are suffocated. Among fresh-water hosts the various species of trout and salmon, the white fish of the Great Lakes region, and the bass and perch are the ones most infected, the parasites being confined to the two genera *Salmincola* and *Achtheres*.

Among salt-water fish many members of the large family of Gadidae, particularly the cod and haddock, the mullets (Mugilidae) the rays (Dasyatidae), the skates (Rajidae), and the sharks are the most common hosts.

*Food.*—These parasites feed upon the blood of their host, as is shown by the fact that they fasten to the gills or fins. They are also furnished with mandibles which were evidently designed for piercing the skin of their host, and whose margin is cut into saw teeth, which not only penetrate the flesh but also lacerate the wound and thus stimulate the flow of blood. Adult females are frequently obtained with their alimentary canal filled with blood, but the color of the latter is quickly removed by the digestive fluids. It is a question whether the male ever eats anything at all, and if he does, what constitutes his food. The following facts and considerations have an important bearing on this question:

1. The adult male possesses a pair of mandibles as large, as powerful, and as suited for laceration as those of the female. He has also a well-developed esophagus and stomach, but in all those examined there is no trace of an intestine or anus.

2. There are no digestive glands connected with the alimentary canal, but the stomach is lined with large gland cells, which are filled with a liquid that undoubtedly aids in digestion. The abundance of these cells more than compensates for the lack of glands, and would be amply sufficient to digest such food as blood.

3. The excretory glands are exceptionally large and are provided with good-sized ducts. It would seem as if they could take care of all the residue that would be left undigested.

4. The male does not live on the body of the host, but clings tightly to some convenient place on the body of the female, and no specimens have ever been found on the fish's gills, although repeated search has been made for them. Males have been found clinging to the second

maxillae of the female, and it is possible that they can crawl along these appendages to the fish's gills and there obtain food. But that does not seem very likely, because there are many species in which the second maxillae are as long as the entire body, and a few species in which they are two or three times the body length. Such a distance would make a rather long journey for so slow moving a creature as the male, and if it was a case of traversing the distance or going hungry, it would most likely result in the latter. Possibly the male may be brought close enough to the gill when the female draws her body down to obtain food. At all events the male must derive whatever food he eats from the fish host and not from the body of the female.

5. The spermatophores attached by the male to the sexual openings of the female are large and contain a goodly number of spermatozoa. Probably a single pair of them would supply the female with sufficient spermatozoa to fertilize all the eggs she can lay during her lifetime. Furthermore, the careful study of the sexual organs of the male given on pages 590, 691, indicates that only a single pair of these spermatophores are formed. Hence it is unlikely that the male lives very long after fastening the first pair in place.

6. Both sexes necessarily go without food during the free swimming period, since their mouth parts then are only suited for obtaining food parasitically. During the second copepodid stage they both suck the blood of the fish upon which they have fastened. The female uses this food to increase greatly in size, as well as to develop her various organs. The male does not increase at all in size, but devotes all his food to the maturing of the spermatophores. After these are fully developed and put in place on the body of the female no more food is required unless a second pair is to be formed, and even then the amount of food demanded would be relatively much smaller. On the contrary, the female must have an abundance of food to ripen her eggs, to carry them in the external sacks until they hatch, and to form, ripen, carry, and hatch successive new batches of eggs. In view of these considerations it is reasonable to suppose that the duration of life for the male is much shorter than that of the female. He requires little, if any, food after he has transferred from the host to the body of the female. And the absence of an intestine and anus would insure the complete digestion and absorption of all the food taken previously. It seems probable, therefore, that the male does eat the fish's blood while it remains attached to the gills, but that it gets no food after it has transferred to the body of the female.

## MORPHOLOGY.

*General body form of female.*—Owing to the degeneration consequent upon fixed parasitism there has been a fusion and elimination of the various body regions. We can no longer distinguish a cephalon, a free thorax, a genital segment, and an abdomen as in the less degenerate families. These are separated in the copepodid stages of development, and may then be discerned with comparative distinctness. But they are entirely lost in subsequent moults, and the body of the adult female usually shows only two regions, and even these are sometimes (*Basanistes*) so fused that it is difficult to distinguish them.

The first region corresponds to the cephalothorax in other copepods, and includes the head with its antennae and mouth parts, the neck, which is sometimes half the entire length or more, and the organs of attachment, the second maxillae. The remainder of the animal is fused together to form the other region, which we may call the trunk and which thus includes the posterior portion of the thorax, the genital segment and the abdomen.

In the copepodid stages the segmentation of the trunk is distinct, but it gradually disappears with maturity, until it becomes wholly lost in the adult (*Clavella*, *Basanistes*), appears only in the anterior portion of the trunk (*Lernaeopoda*), or is indistinct with a fusion of some of the parts (*Achtheres*). But even in those genera which exhibit the most complete fusion of the body parts the musculature is still broken at regular intervals, each of which indicates a point of segmentation.

In some species of *Salmincola*, *Clavella*, etc., there is also a small knob at the posterior end of the trunk, which is well separated from the rest of the body and which has always been called an abdomen. But it is so rudimentary and insignificant when it does appear, and it is so often lacking that it would not be worthy of consideration as a separate body region were it not for the fact that we do find well-differentiated abdomens in the genera *Achtheres* and *Naobranchia*. Accordingly we must determine whether the knob is a true abdomen, corresponding morphologically to those in the two genera just mentioned or whether it is simply a process. On examining serial sections of *Clavella uncinata* we find that the anus opens on the posterior end of the trunk, ventral to the base of the process, while the intestine does not enter the process at all. There is an opening at the distal end of the process, and a tube leading through its center. But this is a sperm tube and leads into a sperm receptacle, which is dorsal to the intestine. The outgrowth, therefore, can not in any way be regarded as an abdomen, but is purely sexual in structure and function. And we would propose for it the name of genital process. To this knob the male clings while he fastens the spermatophores on its tip; from these spermatophores the sperms pass into the tube and thence up into the sperm receptacle. As further proof that this is not an abdomen there are never any anal laminae on it, while they frequently do occur on the posterior end of the trunk (fig. 1).

The size of the process is somewhat proportional to the size of the male; in the genus *Clavella* both the male and the process are very small, while in *Brachiella* the males are large and the process is increased proportionally.

In the cephalothorax the general relations and the varying structure of the head, neck, arms, and trunk furnish very useful generic characters. We may distinguish first genera in which the head and neck are long and slender and flexed dorsally at an angle with the trunk. The second maxillae may be in the same line with this elongated cephalothorax and of about the same length, the two standing across the anterior end of the trunk like the top of the letter T (*Brachiella, Thomsonella, Brianella*).

Or the second maxillae may be much shorter than the cephalothorax and inclined at a different angle (*Clavellodes, Clavellopsis, Naobranchia*). Sometimes the cephalothorax is bent back so far that it rests against the dorsal surface of the trunk and the creature looks as if it were folded and hung from the bend of the fold (*Clavella*). And in one genus (new) there has been a fusion after such a bending, and as a result the cephalothorax is attached to the center of the dorsal surface of the trunk and stands out at right angles to the axis of the latter, while the second maxillae are attached to the anterior end of the trunk some distance from the base of the cephalothorax (*Clavellisa*).

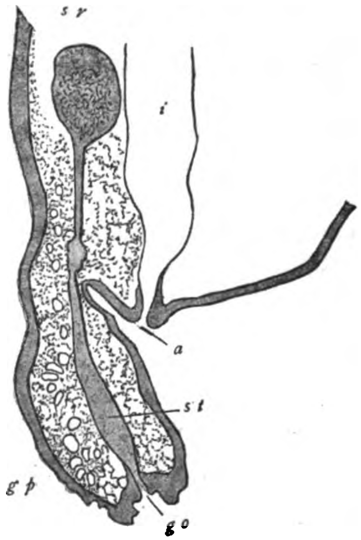

FIG. 1.—SECTION OF CLAVELLA UNCINATA SHOWING *a*, ANUS; *go*, GENITAL OPENING; *gp*, GENITAL PROCESS; *sr*, SPERM RECEPTACLE; *st*, SPERM TUBE; *i*, INTESTINE.

In a second group we find genera in which the head and neck are shorter and stouter, and they either stand in line with the axis of the trunk or are curved over (not flexed at an angle) ventrally. The second maxillae may also be short and stout and stand out at right angles to the trunk axis, and they as well as the posterior margin of the trunk may be hung with fimbriate processes (*Thysanote, Thysanotella*). Or they may be perfectly smooth while the posterior margin of the trunk is furnished with cylindrical processes (*Brachiella, Epibrachiella*).

Again the second maxillae may be long and slender and inclined at an acute angle to the trunk axis, either forward or backward.

They may be entirely separate, each ending in a clasping process (*Charopinus*), or they may be joined by an ordinary bulla. In this latter condition the posterior margin of the trunk may be wholly without processes (*Tracheliastes*) or may have a single ventral pair (*Parabrachiella*) or a single dorsal pair (*Charopinus*).

In the third group we find genera in which there is no neck at all; the head is short and wide and may be in line with the trunk axis or inclined to it. When the two are in the same line we may find a single pair of processes on the posterior margin of the trunk which are either ventral (*Lernaeopoda*) or dorsal (*Lernaeopodina*) to the egg strings. If there are no posterior processes (*Vanbenedenia*) the second maxillae extend straight forward, are rigid, and their base has been moved until they are virtually dorsal instead of ventral or lateral, and cover the back of the head. When the head and trunk are inclined to each other we find no posterior processes, but there may be an unpaired median genital process (*Salmincola*) like that in *Clavella*. The second maxillae are also usually turned backward along the ventral surface of the trunk and their bases are connected around the posterior end of the head by a stout ridge.

Calling the second maxillae by the common name of arms, these enlarged bases correspond to a pair of misshapen shoulders.

Sometimes the trunk is covered with longitudinal rows of knobs or tubercles (*Basanistes*). Again there are neither knobs or shoulders, but there is a well-defined abdomen behind the bases of the egg strings (*Achtheres*).

*General body form of male.*—The male never becomes fixed in position and hence does not usually show as much degeneration as the female. The second maxillae are never permanently attached by means of a bulla and so do not develop into long arms, but retain their claws and are very similar to the maxillipeds both in form and function. The trunk is distinctly segmented more often than in the female and is usually furnished at the posterior end with a pair of well-defined anal laminae.

In some genera the cephalon and in others the whole body is covered with a carapace, but in the majority of genera this is lacking. The male remains a pigmy and there is a greater disparity in size between the two sexes than can be found anywhere else among the parasitic copepods.

There is also a folding of the body in these males, but in a manner different from that just described for the females.

In the female the cephalothorax was flexed either forward or backward and sometimes rested against the dorsal surface of the trunk, but there was no fusion of the two parts except in the single genus *Clavellisa*. Here in the males, on the contrary, the cephalothorax is always folded forward against the ventral surface of the trunk, and the two are frequently so thoroughly fused as to be indistinguishable.

The different genera show varying amounts of flexion and fusion and we may separate the types as follows:

1. The cephalothorax and trunk may be approximately in the same straight line, when of course there is neither flexion nor fusion.

These are large males, a millimeter or more in length; the mouth tube, the antennae, and the first maxillae point forward in the same direction as the body axis, or but little inclined to it and the anal laminae similarly point backward; the second maxillae and maxillipeds extend outward at right angles to this axis.

The trunk may be well segmented (*Achtheres* and *Thysanotella*), partially segmented (*Epibrachiella*), or wholly devoid of segmentation (*Thysanote*, *Brachiella*, and *Vanbenedenia*). There is a carapace covering the entire body in *Thysanote*, a well-defined cephalic carapace in *Brachiella*, a poorly defined one in *Epibrachiella*, and none at all in the other three genera.

2. The cephalothorax may be turned forward at right angles to the trunk axis, so that the mouth tube, the antennae, and the first maxillae point outward parallel with the second maxillae and maxillipeds; the anal laminae usually point outward also, though they may point backward (*Charopinus*), or may even be turned dorsally (*Lernaeopoda*). The trunk may be well segmented (*Charopinus*, immature *Lernaeopoda*), or may show no signs of segmentation (*Probrachiella*, *Parabrachiella*, adult *Lernaeopoda*). *Lernaeopoda* has a distinct cephalic carapace, *Charopinus* has a larger but less distinct one, while *Parabrachiella* and *Probrachiella* have no trace of any.

3. There may be two flexures, the mouth tube and antennae being parallel with the greatly reduced trunk, as well as with the maxillae and maxillipeds, while the posterior portion of the cephalothorax stands at right angles to all of them. This is found in the single genus *Lernaeopodina*, whose males are considerably smaller than those of the other genera already mentioned.

We have here therefore complete flexion but no fusion; there is no carapace visible and the trunk shows no traces of segmentation.

4. There may be similar flexion combined with fusion so that we can no longer distinguish the body regions. The sexual opening is at the end of a rounded process just behind the second maxillae, and extending outward parallel with them, and the anal laminae have entirely disappeared. What was originally the long diameter of the body may still be longer than the transverse diameter (*Naobranchia*, *Clavellopsis*) or the latter may have increased sufficiently to exceed the former (*Clavellisa*, *Clavellodes*). The result in *Clavellodes* is peculiar; there is apparently an oblong body, squarely truncated at one end, with the mouth tube and all the appendages arranged along this truncation, parallel with the long axis. But this is really the same flexion that was seen in *Lernaeopodina* combined with complete

fusion, so that the long axis is actually transverse and not longitudinal.

In *Naobranchia* the sexual process is as long as the maxillipeds and suggests very strongly the trunk of *Lernaeopodina;* there is also a carapace which covers the entire body.

5. Finally in the genus *Clavella* there has been an even greater flexion and fusion of the body, for now the sexual process is closer to the second maxillae and sometimes is carried forward to a point between them, so as to be concealed in side view.

The transverse diameter is still longer than the longitudinal one, and there are no signs of any carapace.

*The eye.*—None of the adults in any genus possess eyes; the eye in this whole family is extremely rudimentary, appears only for a short time during the development stages, and then entirely disappears.[1]

*The appendages.*—In the adults of both sexes there are six pairs of appendages, namely, two pairs of antennae, one pair of mandibles, two pairs of maxillae, and one pair of maxillipeds. The reason for regarding the penultimate pair as second maxillae is that they appear in early development in front of the suture which separates the head from the thorax, while the posterior pair appear behind that suture.[2]

In the adult males of the genus *Achtheres* there may be also one or two pairs of very rudimentary swimming legs. But these are only vestiges of the developmental stages and probably disappear at the first molt after the male has attached himself to the female. Kurz claims (1877, p. 400) to have found in the female of *Clavellisa emarginata* on the posterior end of the trunk the rudiments of the last pair of swimming legs. Before admitting this claim we must consider first the fact that only two pairs of legs appear during development and these are attached to the two anterior segments of the free thorax. If either of these pairs remained in the adult stage they must have migrated the whole length of the trunk in order to appear on its posterior margin. On the other hand, it would be rather strange for the rudiments of the fifth or sixth pair of legs to appear in the adult when only two pairs appeared in the developmental stages.

Again, if Kurz's three figures (pl. 25, figs. 8, 9, and 10) be carefully compared with respect to the orientation of the trunk, it will be seen that figure 8 (designated "Bauchansicht") actually represents the ventral surface of the trunk and the dorsal surface of the cephalothorax, except the head, which is turned in profile. In figure 10 (designated "vom Bauch gesehen") the cephalothorax has been turned forward out of its natural position, and we are actually looking at the dorsal surface of both cephalothorax and trunk. But this is the surface on which the so-called swimming legs appear, and their presence in such a position is difficult to understand.

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[1] Proc. U. S. Nat. Mus., vol. 39, p. 204. Compare also fig. 13, p. 593.

[2] Compare also Hansen, 1893, p. 421; Giesbrecht, 1893, p. 84; Claus, 1895, p. 56; Wilson, 1910, p. 200; 1911, pp. 281 and 323.

*The antennules or first antennae.*—These are attached to the frontal margin of the head, between the bases of the second antennae and the proboscis, often somewhat more on the ventral than on the dorsal surface, but usually the most dorsal of all the appendages.

In *Tracheliastes* and *Basanistes* they arise on the dorsal surface of the head and are not turned downward and forward as in the other genera. They are extremely simple and are made up of three or four joints, more or less distinctly separated. The basal joint is the thickest and is fused with the head, the other joints are cylindrical and taper distally, and the terminal joint is armed with a few short nonplumose setae or spines.

*The antennae, or second pair.*—These are characteristically modified in the present family. They arise from what may be termed the anterior corners of the head on either side; they are flattened laterally and turned forward and inward along the anterior margin of the head, until in some species their tips meet or even overlap at the midline. They are made up of a thick basipod and two short rami, one dorsal and one ventral; the endopod or dorsal ramus is usually much larger than the exopod, is thick and fleshy, unsegmented, and bluntly rounded at the tip, where it is armed with a few short spines or teeth (*Charopinus, Achtheres, Brachiella*), sometimes with olfactory cylinders (*Clavella*, sp.) or even with claws (*Lernaeopoda*, sp.). The exopod is slender and cylindrical, usually two-jointed, and is tipped with tactile hairs, olfactory cylinders, or a chitin claw.

The claw is more common in the male, where these antennae serve as attachment organs, where they have a stout musculature, and where the claw sometimes shuts down against the terminal joint and is chelate in function. In rare instances in the female the two rami are arranged like the jaws of a chela and must function as a grasping organ (*Lernaeopodina longimana* and *Charopinus ramosus*).

*The mouth tube or proboscis.*—This is attached between the bases of the second antennae, is conical in shape, and is directed downward and forward against the skin of the host. It is composed of an upper and an under lip; each side of the latter is split into two lamellae, between which is fastened the corresponding side of the former, so that the two lips are loosely joined along their lateral edges to form a closed tube. But they are not held together very firmly, and it is an easy matter to separate them with a needle (fig. 2). At the base of these lateral seams both lips are cut away a little to form a three-cornered opening through which the mandible projects into the interior of the tube.

The under lip is somewhat larger than the upper and more spoon-shaped, so that its anterior end, around the mouth opening, is curved like a horseshoe. The upper lip is flatter, broadened at the base, and narrowed toward the tip, which is bluntly rounded and armed with a tuft of fine hairs, or with a short spine. Each lip is supported around its margin by a chitin framework, which is articulated with the chitin framework of the head, so as to allow the proboscis to move freely backward and forward. The anterior margin of the under lip around the mouth opening is also divided into two lamellae, of which the inner one serves to contract the mouth opening while the outer one is cut into a fringe along its free margin. The length and thickness of this fringe varies considerably in different genera and species. Usually it is more than half the width of the lamella, in which case the fringe looks as if it were made of stiff hairs standing in rows around the mouth opening. Again, the fringe may be so short that it can only be detected with difficulty, and hence appears to be lacking (*Naobranchia*).

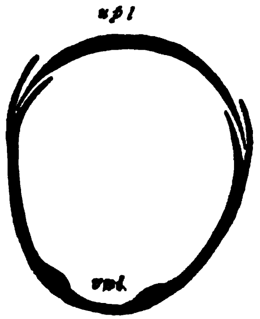

FIG. 2.—CROSS SECTION OF PROBOSCIS (DIAGRAMMATIC); *upl*, UPPER LIP; *vnl*, LOWER LIP.

When the proboscis is applied to the host for the purpose of drawing blood, this bordering fringe, together with the rest of the membrane, is spread out around the tip of the proboscis like a sucking disk and probably assists in obtaining the blood.

There are no chitin rods nor any supporting framework in this sucking border, as was clearly shown by Kurz.

*The mandibles* are rigid chitinous blades, operating inside the proboscis, although they originate on the ventral surface of the head, outside of it, and only become inclosed when the edges of the upper and lower lips are fastened together. The base of the mandible always remains outside of the proboscis, inserted in a fold of the skin, and only the blade or terminal portion enters the mouth tube through the triangular opening at the base of the two lips. The blade of the mandible reaches to the tip of the proboscis, or may even project a little beyond the latter. It is strongly flattened dorso-ventrally and brought to a sharp edge along the two lateral margins. It is widest at the center and tapers toward both ends; it is also frequently bent at or near the center, so that the terminal portion curves in toward its fellow on the opposite side. At the tip the inner margin is cut diagonally and set with wicked teeth.

Kurz distinguished three kinds of these mandible teeth; the first he called principal teeth (Hauptzähne). They are much larger and stouter than the others, they usually curve backward, and they alternate with the second kind, which he called intermediate teeth (Zwischenzähne). These are very minute, triangular in shape, and they occupy the base of the angles between the principal teeth. The third kind were called secondary teeth (Nebenzähne), and they are found in a continuous row behind the principal teeth. They are much smaller than the latter and diminish rapidly in size from in front backward. The mandibles in the genus *Naobranchia* (Kurz's *Cestopoda*), and rarely in the males of other genera, have no intermediate teeth, and the other two kinds are often so nearly of the same size that it is hard to distinguish them.

The mandibles are operated as follows: The base being inserted in the fold of skin outside the proboscis holds the appendage rigidly in position, with its toothed tip at the opening of the proboscis, the two mandibles almost or just touching, and the two rows of teeth facing each other. The proboscis is then thrust against the skin of the host and the marginal fringe is flattened out, laying bare the tips of the mandibles. These are pushed into the skin far enough for the teeth to get a good hold. The mandibles are then drawn back into the proboscis by means of powerful retractor muscles (*rm*, fig. 3), which run from the base of each mandible backward and outward and are fastened to the side wall of the head. As the base of the mandible is pulled by this muscle the skin fold in which the mandible is inserted is turned inward like the end of a glove finger. The withdrawal of the mandibles also brings the fold of the host's skin, in which their teeth are caught, up into the mouth opening. Here the skin is further lacerated by a sawlike motion until the blood flows freely. During retraction the mandible is also twisted through an angle of 90° upon its long axis, as was first discovered by Kurz. This brings the teeth around, so that instead of facing each other, as at first, the toothed portions of the mandibles both point in the same direction—ventrally. This flexion, after the mandibles have been thrust into the skin of the host, gives them a better hold and keeps the wound open so that the blood will flow freely. The maxillipeds, and in some species the second antennæ, are also inserted in the host's skin and help to hold it up against the mouth tube.

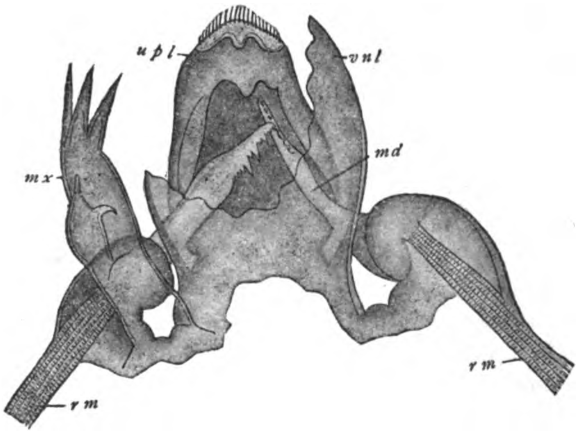

Fig. 3.—Mouth-parts of Lernaeopoda galei (Achtheres selachiorum Kurz). *md*, Mandible; *mx*, first maxilla; *rm*, retractor muscle of mandible; *upl*, upper lip; *vnl*, under lip. The mandible on the right side of the figure has been retracted and twisted through an angle of 90°.

*The first maxillae* (*mx*, fig. 3) are very rudimentary and palplike and contain no chitin, but are soft and flexible like the first antennae. They have been variously interpreted by different authors, the most of whom have called them palps and have connected them with the second antennae or the mandibles. But Kurz proved conclusively that they are appendages of the same rank as the antennae and mandibles; that they have no connection with either, but are moved by an entirely independent set of muscles, and that in the majority of instances they are themselves furnished with a very respectable palp. Furthermore, it was found by the present author[1] that these appendages are innervated by a separate nerve from the infra-esophageal ganglion, which adds the final touch to the proofs already accumulated. Their position is on the sides of the proboscis, close to its base and much nearer the ventral than the dorsal margin, and they do not usually reach beyond the mouth opening. Their general form is narrow and cylindrical, slightly contracted at the base where they join the proboscis, and divided at the tip into two or three fingerlike rami, each of which terminates in a stout and acuminate soft seta. At or near the center, on the ventral surface and at the inner margin, each maxilla gives off a palp, which is usually divided at the end, like the maxilla itself, into two or three fingerlike processes, each armed with a soft seta. There is no genus in which the maxillae show definite segmentation, but they always appear one-jointed.

The maxillae in the male correspond very closely with those of the female of the same species.

*The second maxillae* have become the principal organs of attachment in the present family, and accordingly we find them modified in various ways to serve this function. When they first appear in the metanauplius stage they are clawed appendages, similar in all respects to the maxillipeds. In the free-swimming or first copepodid stage, when the larva attaches itself to its host or shortly afterwards, these second maxillae are fastened to the proximal end of the frontal filament. In the female this union of maxillae and filament becomes permanent throughout life, and the two fuse thoroughly until all that is left of the filament is the button or bulla which joins the tips of the maxillae and serves to anchor them firmly in the tissue of the host. No such union takes place in the male and his second maxillae remain clawed appendages, very similar to the maxillipeds.

In the female, after the fusion of the maxillae and filament, the former lose their claws and all traces of segmentation. Even the internal muscles are entirely changed and become longitudinal bundles running the whole length of the appendage without a break. This length varies greatly in the different genera and furnishes, with other coordinate differences, excellent generic characters as already noted (see p. 573). In one species, *Lernaeopodina longimana*, the arms, as these transformed second maxillae are called, are as slender as threads and fully three times the length of the entire body. On the other hand some species of *Clavella* have no arms at all; they have entirely disappeared and the attachment bulla is sessile upon the ventral surface of the body. Yet even in these species we find the remains of the maxillary muscles arranged in pairs on either side of the sessile bulla. Between these two extremes there is almost every gradation.

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[1] Proc. U. S. Nat. Mus., vol. 39, pl. 34, fig. 33.

The arms are usually separated to their tips, where they are united to the pedicel of the bulla. In the genus *Clavella*, however, the arms are fused together more or less, sometimes for their entire length. When they first appear these second maxillae are on the head and in front of the maxillipeds, but during subsequent development the two usually exchange places. The second maxillae then migrate onto the first thorax segment and may move a long distance behind the other mouth parts (*Clavellisa*, *Brianella*, etc.).

The bulla is composed of the hardened secretion of the frontal gland and is usually mushroom-shaped, but may be club-shaped (*Basanistes*, *Salmincola thymalli*), button-shaped (*Clavellopsis sargi*, *Brachiella triglæ*), funnel-shaped (*Clavellopsis fallax*), goblet-shaped (*Brachiella hostilis*), star-shaped (*Tracheliastes stellifer*), or even flattened out like a plate (*Salmincola inermis*). The way in which this bulla is fastened to the host has already been described.[1]

There is one thing to be added which was also noted by Kurz. The viscid secretion which fastens the bulla to the skin of the host acts as an irritant and causes the skin to fester and swell into a wall or fold, which rises up around the bulla and finally entirely envelops it. This adds greatly to the security of the attachment; in fact the only way in which the parasite can be detached is by dissecting out the bulla, which usually proves to be a difficult process. We should also notice the peculiar muscle bands which serve as second maxillae in *Naobranchia*, and the unique sucking disks just outside the base of the maxillipeds (see p. 662).

*The maxillipeds.*—These are clawed appendages, similar to those found in all the copepod families. They consist of a powerful basal joint well supplied with strong muscles, which operate the terminal claw and flex it down against the inside of the basal joint. The claw is usually straight or slightly curved, and is often reinforced near the tip by a short spine or secondary claw.

The inner surface of the basal joint, against which the claw shuts, is also roughened and armed with various teeth, processes, spines, etc., to increase the firmness of the hold. In the male the claw is usually curved more than in the female, and in *Thysanotella*, if Bassett-Smith's figure be correct, it describes three-quarters of a circle. These maxillipeds in the female have lost their function of attachment organs, and are used only for pulling the head down to the skin of the host and holding it while the parasite gets its food. In *Tracheliastes* even this function is lost, and it is difficult to understand how they can be used at all, situated as they are between the bases of the second maxillae (see plate 40, fig. 106).

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[1] Proc. U. S. Nat. Mus., vol. 39, p. 211.

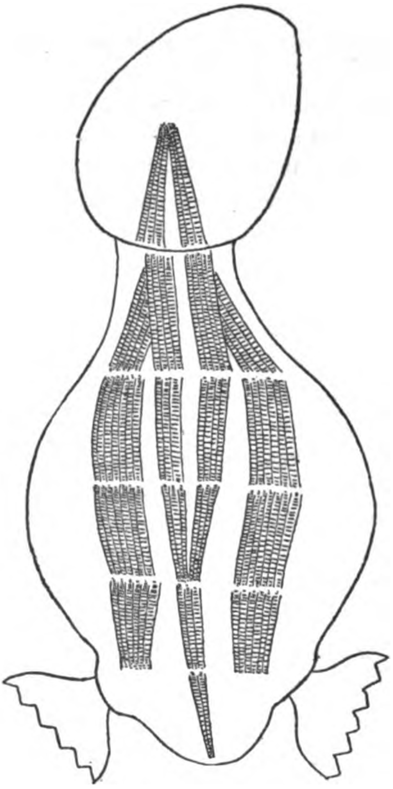

FIG. 4.—DORSAL MUSCLES OF ACHTHERES AMBLOPLITIS.

*The muscular system.*—This is extremely simplified, and is as much reduced as is possible consistent with retaining any power of motion. We may divide the musculature of the adult female as follows:

1. *Dorsal muscles.*—Along either side of the median line of the dorsal surface are two bands of longitudinal muscles, the outer band considerably wider than the inner one (fig. 4).

These bands are curved lengthwise, being farther apart at the center and closer together at the ends. The four bands are each broken at the points which represent the dividing lines between the different body segments, and thus furnish the best, and in some genera (*Basanistes*, *Clavella*, etc.) the only, evidence of segmentation. According to this evidence the body of the female of *Achtheres* is made up of a cephalothorax, which is a fusion of the head and first thorax segment, and a trunk, which is made up of three thorax segments, a genital segment, and a one-segmented abdomen. The inner pair of muscle bands start from a common point of attachment at about the center of the dorsal surface of the cephalothorax. They diverge until they reach its posterior margin, run approximately parallel through the second and third thorax segments, and converge in the fourth segment, meeting again at its posterior margin. In the genital segment and in the abdomen there is but a single fused muscle band along the median line. A similar fusion takes place on the ventral surface, this time between the components of the right and left pairs.

The outer pair of dorsal muscle bands start also from a common point of attachment in what may be called the throat of the parasite on the ventral surface of the first thorax segment, just behind the mouth parts. They run upward toward the dorsal surface and rapidly outward, so that at the posterior border of the second segment each is outside of the inner pair. They then run backward outside of the latter and parallel with them as far as the posterior border of the genital segment, where they abruptly cease.

2. *Ventral muscles.*—Four similar bands run along the ventral surface, but with these differences; they start side by side at the anterior border of the second thorax segment, diverge a little, then converge, and end abruptly at the posterior margin of the genital segment. Instead of the median pair being fused it is the two on either side of the median line which are partially fused in the fourth segment and completely fused in the genital segment (fig. 5).

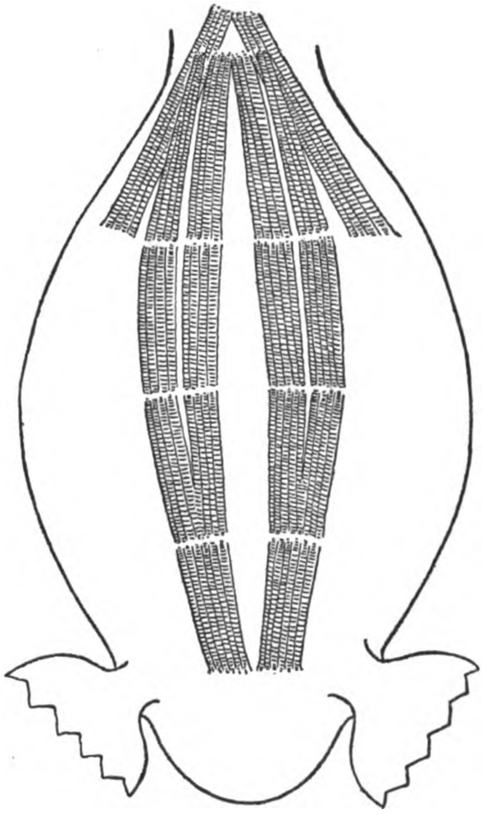

FIG. 5.—VENTRAL MUSCLES OF ACHTHERES AMBLOPLITIS.

3. *Muscles of the second maxillae.*—During the copepodid stages these appendages are two-jointed and furnished with claws, and the muscles are arranged like those of other two-jointed appendages. But after fixation to the host and the subsequent fusion of the second maxillae with the attachment filament the jointing in these appendages is lost. And in place of the original musculature we now find two bands of muscles running the entire length of the appendages without a break, even though that be three times the length of the entire body (*Lernaeopodina longimana*).

In those genera like *Clavella*, where the second maxillae are often lacking, leaving the attachment bulla on the ventral surface of the thorax, we still find the rudiments of a pair of longitudinal muscles, which represent the original appendages.

Similarly in those species in which the second maxillae are united throughout their entire length these longitudinal muscles remain separate and thus witness to the paired origin of the attachment organs.

4. *Muscles of the other appendages.*—The mandibles and first maxillae are each supplied with the usual muscles. The one attached to the base of the mandible (*rm*, fig. 3) is a powerful retractor, which not only draws the mandible back into the proboscis tube but also turns it sidewise, so that the toothed edge points ventrally. There may be either one or two muscles connected with the base of the first maxillae, but the amount of motion they produce is very slight. The maxillipeds are provided with the usual muscles found in such two-jointed appendages, those designed for the flexion of the terminal claw being usually very powerful. The muscles of the first and second antennae also produce but little motion; these appendages are often very obscurely jointed and the musculature then gives the most reliable information as to the number of joints. In some genera (*Basanistes*, etc.) the second antennae are exceptionally developed and are furnished with the musculature necessary to enable them to function as organs of prehension. The mouth tube is also furnished with muscles by means of which it can be directed and held against the skin of the host or withdrawn at pleasure.

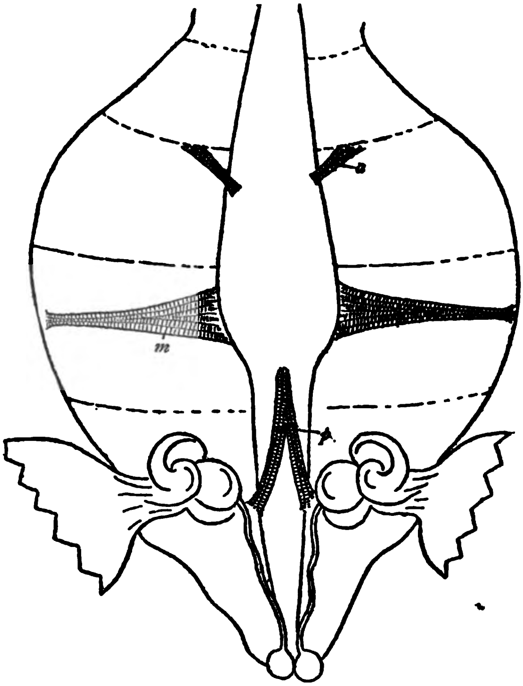

FIG. 6.—CIRCULATORY MUSCLES OF ACHTHERES AMBLOPLITIS. *a*, ANTERIOR; *m*, MEDIAN; *p*, POSTERIOR.

5. *Special muscles.*—In addition to the muscles already enumerated there are others which serve specific purposes and which consequently deserve particular notice. The first of these may be termed the circulatory muscles, since it is through their contraction and relaxation that the meager circulation in these parasites is maintained. There are three pairs of them, an anterior pair in the third thorax segment, a median pair in the fourth segment, and a posterior pair in the fourth

and fifth segments. The anterior pair (*a*, fig. 6) are short and cylindrical and each originates in the groove separating the second and third thorax segments on the dorsal surface about half way from the lateral margin to the midline. It then runs diagonally inward and backward and is inserted in the side of the digestive tube, a little above the center.

The median pair (*m*) are strongly flattened dorso-ventrally; each originates at the center of the lateral margin of the fourth segment, extends directly inward, and is inserted in the wall of the stomach; it is narrow at its origin but widens out greatly at its insertion. The posterior pair (*p*) are cylindrical again; each originates on the dorsal wall of the genital segment, extends diagonally forward and inward, fuses with its fellow from the opposite side, and is inserted in the center of the dorsal wall of the intestine. The anterior and posterior pairs pull the digestive tube backward and forward, while the median pair pull it to the right or left.

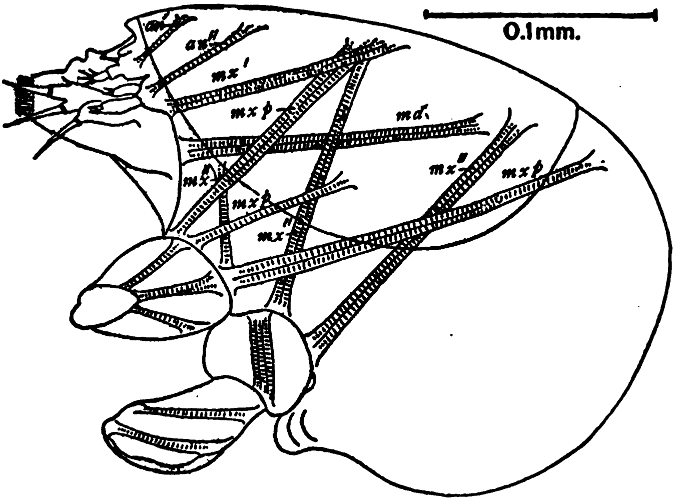

FIG. 7.—THE MALE OF CLAVELLISA CORDATA. *an'* AND *an''*, ANTENNAL MUSCLES; *md*, MANDIBLE MUSCLE; *mx'* and *mx''*, MAXILLARY MUSCLES; *mxp*, MUSCLES OF THE MAXILLIPED.

Another pair of special muscles may be called the ejaculatory muscles; they are situated on the dorsal surface of the semen receptacle in the genital segment (*em*, fig. 8). Each extends from the thickened margin of the external opening of the oviduct diagonally inward and backward to the center of the dorsal surface of the sperm receptacle. A contraction of these muscles aids in forcing the eggs out into the external sacks, and may at the same time help to discharge the contents of the sperm receptacle.

6. *The musculature of the male.*—In those males in which the cephalothorax and trunk are either in the same line (*Achtheres*, etc.) or somewhat flexed without any fusion (*Brachiella*, etc.) the general

scheme of musculature is similar to that of the female. But where there is not only flexion but also complete fusion (*Clavella*, *Clavellisa*, etc.) the musculature is entirely changed. We no longer find any dorsal and ventral body muscles, or any special respiratory muscles, but all the movements of the body are accomplished by means of muscles connected with the appendages. The male of *Clavellisa* may be taken as an example (fig. 7). The muscles of the left side only are given in the figure, and it is to be understood that each is duplicated on the right side. It will be noted that there are single muscle strands connected with the first and second antennae (*an'*, *an''*), larger and more powerful single muscles connected with the first maxillae (*mx'*) and the mandibles (*md*), while there are three stout muscles attached to each second maxilla (*mx''*) and maxilliped (*mxp*). Each of these muscles is inserted in the base of the appendage to which it belongs and runs diagonally into the body to its origin, somewhere on the dorsal or lateral walls.

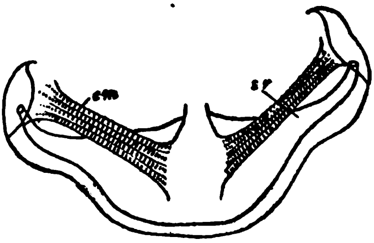

FIG. 8.—DORSAL VIEW OF EJACULATORY MUSCLES (*em*) AND SPERM RECEPTACLE (*sr*) OF ACHTHERES AMBLOPLITIS.

All the necessary motions in the male are accomplished by these appendage muscles. In these pigmy males, therefore, the last vestige of segmentation, namely, the interrupted longitudinal muscle bands, has completely disappeared.

## RESPIRATION.

There is in this family nothing which resembles, or functions as, a respiratory organ; there is not even the opening and closing of the anus and rectum (anal respiration) so prevalent among the free-swimming forms and in the Caligidae and Ergasilidae.

In the female there are no oblique muscles attached to the sides of the rectum, and in the male there is no anal opening, so that such a method of respiration is impossible in both sexes.

Apparently the only means of aërating the blood is through the body walls, which are comparatively thin. Furthermore the demands for aëration have been reduced to a minimum in these parasites, who have lost all freedom of motion, whose food is very easy to digest, and whose circulation is extremely crude.

## CIRCULATION.

There is no heart nor any blood vessels in the Lernaeopodidae; there are not even any lacunae through which the blood might flow. The body is virtually a bag, in the cavity of which are suspended the various organs, while the spaces around them are entirely free, and every part is in direct communication with every other part. The blood moves about freely through these open spaces and a sort of circulation is accomplished by a rhythmic contraction of the three pairs of special muscles already described (see p. 584). The muscles in each pair contract alternately and pull the intestine away from the midline, now toward the right side and now toward the left, or forwards and backwards. When the intestine is pulled to the right the blood on that side of the body is pushed precipitately forward into the head. At the same time on the left side of the body the blood streams backward from the head to fill up the space formerly occupied by the intestine. These motions are reversed when the intestine is pulled to the left, and this backward and forward streaming constitutes all the circulation.

The strong peristaltic movements of the stomach and intestine help to push the blood along if it lies in contact with the wall of the digestive tract. We have used the term blood here, but of course it can bear that name only by courtesy. It is not really blood like that found in the Argulidae, Caligidae, and Chondracanthidae, but is simply the liquid which fills the body cavity. It has no corpuscles but may serve to distribute the oxygen absorbed through the body walls.

In the male there is not even this apology for a circulation, and in all those which have been examined there has never been observed a streaming of the liquid contents of the body in any direction. The body of the male is reduced to such a small size that probably enough oxygen can be obtained by direct absorption through the body walls.

## THE DIGESTIVE SYSTEM.

In the present family this consists of a mouth, an esophagus, a stomach, and an intestine. The mouth-tube is turned forward and is the most anterior part of the body, with the mouth-opening at its tip. The structure of the mouth and the mode of filling it with blood have already been described (see p. 577).

There are no glands connected with the mouth and the only use it serves is as a funnel to guide the blood into the esophagus, which is slender and thread-like and almost straight (fig. 122).

It passes abruptly into the enlarged stomach, a thick sphincter muscle being found at the point of junction. This latter is in the head and about on a level with the bases of the maxillipeds, even in those genera (*Clavella*, *Clavellisa*, etc.) which have very long necks. In such genera most of the stomach, and by far the most important part, is located in the neck. The stomach passes so insensibly into the intestine that it is impossible to distinguish any point of separation. Both stomach and intestine possess thick walls made up of an outer serous membrane, a median muscular layer, and an inner glandular layer. The latter contains many modified cells, which are filled with a digestive fluid, and thus take the place of digestive glands. In the long-necked genera that portion of the stomach, if any, which enters the trunk is narrowed and flattened and so crowded by the reproductive organs that it functions only as an intestine.

## THE EXCRETORY SYSTEM.

In the Lernaeopodidae the excretory system is made up of two pairs of glands. The maxillipedal pair are on the dorsal side of the body, behind the bases of the maxillipeds. Each starts at three different centers, one median and two lateral, which increase in size and gradually fuse together. A spirally convoluted duct leads to the base of the maxilliped where it opens to the surface. The maxillary pair are situated at the bases of the second maxillae; a straight duct leads from each gland outward and opens on the inner surface of the maxilla (fig. 141).

In those genera (*Clavella*, *Clavellisa*, etc.) where the second maxillae have disappeared and the bulla is on the ventral surface of the trunk, the maxillary glands have migrated into the trunk and can be found on either side of the bulla. This is also the case in *Naobranchia* where the second maxillae are present but are so modified that they can not contain the glands (p. 661).

In many species also, of various genera, the second maxillae are so slender and their inner cavity is so filled with the longitudinal muscles that there is little room left for the glands. In such species there is often a swelling on the outer surface of the maxilla near its base, and in this swelling is located the gland (fig. 221). Or the swelling may be on the side of the neck near the base of the second maxillae (fig. 109.)

## THE NERVOUS SYSTEM.

The nervous system[1] consists of a very large infra-esophageal ganglion and an equally small supra-esophageal ganglion (fig. 122). From the anterior end of the latter two pairs of nerves are given off, one of which goes to the first antennae and frontal margin, while the other larger pair supply the second antennae and upper lip. From the posterior end a third pair of nerves run backward along the anterior walls of the stomach, the dorsal portion of the head, the frontal gland, and the maxillipedal gland.

From the anterior end of the infra-esophageal gland a pair of nerves run forward to the base of the lower lip and send a branch to the mandibles. From the ventral surface of this ganglion a slender nerve goes to the first maxilla on either side, another to the second maxilla, and from the postero-ventral corner a larger nerve runs to the maxilliped. Just in front of this last nerve a delicate nerve thread runs diagonally to the sides of the maxilli-pedal and maxillary glands. At the posterior corner of the ganglion a slender nerve extends backward along the ventral walls of the stomach and close to its fellow from the other side. These nerves show no ganglionic swellings and no ganglion cells. The nervous system is thus practically concentrated in the infra-esophageal ganglion.

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[1] Good figures of the nervous system of both sexes were published in these Proceedings—vol. 39, plate 34.

## THE REPRODUCTIVE ORGANS.

The reproductive system in the female consists of paired ovaries and oviducts, an unpaired sperm receptacle, and paired cement glands. In the male it consists of paired testes and vasa deferentia, and paired spermatophore receptacles.

The ovaries and testes lie in what may be termed the small of the back, between the stomach and the dorsal body wall. From the posterior ends are given off the oviducts and vasa deferentia which run around the stomach to the ventral surface, and then backward to the openings in the sides of the genital segment.

In both sexes these ducts become so convoluted and swollen at maturity that they fill the entire cavity on either side of the digestive tract, which is flattened laterally into a mere slit.

The sperm receptacle in the female lies in the posterior portion of the trunk, sometimes dorsal and sometimes ventral to the intestine. In those genera (*Achtheres*, etc.) which have an abdomen the receptacle is dorsal and consists of a bag nearly twice as long as wide, placed transversely in the trunk and flattened dorso-ventrally. Each end of the bag is prolonged at the anterior corner into a slender tube which runs outward to the oviduct and opens into the latter just inside of its external opening; at the posterior corner into a canal, the vagina, which leads diagonally backward and inward to the posterior margin of the abdomen, where it opens to the exterior alongside the midline. In those genera (*Clavella*, etc.) which have no abdomen the sperm receptacle is ventral to the intestine, is not as long as in *Achtheres*, and the vaginae are usually more or less fused. They run back through the genital process and open at its tip, either closely side by side or, if fused, in one common opening.

When the spermatophores are fastened by the male upon the abdomen or genital process of the female their tubes enter these external openings (vulvae). And the spermatozoa which they contain are discharged through the vulvae and vaginae into the receptacle. In the present family there is no crossing of the tubes of the spermatophores, as in the Caligidae, but each spermatophore empties into the vagina on its own side of the body (fig. 8, p. 586). Even in those genera where the vaginae are fused and have a common vulva the spermatophore tubes are still uncrossed.

When once filled the sperm receptacle holds enough to fertilize all the eggs the female will ever lay. Whenever an egg is sufficiently matured it passes down the oviduct and out into the external cases. As it passes the opening of the sperm tube it is fertilized, and this individual fertilization is responsible for the remarkably small number of eggs that fail to develop. The cement glands are very large and in *Achtheres* fill the entire sides of the thorax segments in front of the genital segment. Each is crescent-shaped, its outer convex surface fitting snugly inside the lateral body wall, while its inner surface is nearly straight. It consists of three parts, separated by well-defined constrictions. The anterior, terminal portion (*t*) is about one-quarter of the entire length and is filled with a fine-grained matrix out of which is formed the cement substance. This is the real glandular portion where secretion is carried on. The central half (*c*) is a little broader than the terminal portion and is somewhat flattened dorso-ventrally; its wall is transversely striated and must contain muscle fibers since it is more or less contractile. It is evidently used for the storage of the cement substance until the eggs have fully ripened (fig. 9).

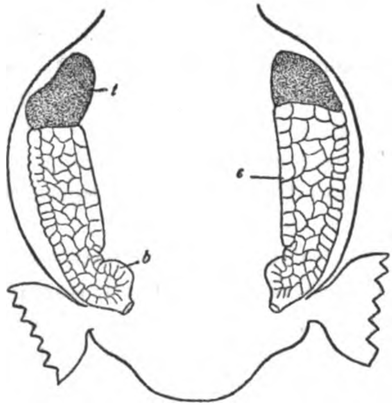

FIG. 9.—CEMENT GLANDS OF ACHTHERES AMBLOPLITIS. *b*, BASAL PORTIONS; *c*, CENTRAL; *t*, TERMINAL.

The posterior basal portion (*b*) forms the duct or tube through which the cement substance passes out into the oviduct. It has a sharp curve or bend on its inner margin around which the tube passes and which acts as a sort of valve to regulate the flow. The cement glands of all the other genera in which they have been observed are similar to those of *Achtheres*.

In the male the vasa deferentia lead around the side of the stomach to the ventral surface, swing back again to the dorsal surface, run diagonally backward to the center of the lateral surface, turn a little toward the dorsal surface, and finally pass diagonally backward to the opening on the ventral surface of the genital segment. The swollen anterior portion of these convolutions is a combination of cement gland and vas deferens, the fine-grained gland cells secreting the viscid substance which composes the covering of the spermatophore. The posterior portion in the adult male is enlarged into a receptacle within which the spermatophores are gradually matured and filled with spermatozoa (compare fig. 198).

## ONTOGENY.

The complete life history of *Achtheres ambloplitis* has already been published.[1]

Fasten has also given us an account[2] of the free swimming larva of *Salmincola edwardsii*. Some of these copepodid larvae, admirably mounted, were loaned to the present author for study and comparison, and have proved of great value.

It only remains, therefore, to restate the life history very briefly, and to compare the larvae of the two genera above named with those of *Clavella*, the material for which is here presented for the first time. Inside the ovary are many long filaments, which are connected with the older oocytes and whose terminal cells develop successively one after the other. In *Clavella uncinata* (fig. 10) these filaments are given off dorsally and pass down ventrally into the convolutions of the oviduct, where the end cells can be seen in various stages of development. These filaments are longer and less convoluted in *Clavella* and *Clavellisa* (fig. 11) than in *Achtheres* or *Naobranchia* (fig. 12). They stain readily and in double-stained sections always show a dark purple color. A vitelline membrane is visible around the end cell, even before it separates from the filament. Inside of this membrane the entire substance of the egg is made up of yolk globules evenly distributed through a fine matrix of protoplasm. Scattered about are numerous large vacuoles of different sizes, those nearest the periphery being usually the smallest. As the eggs pass down the oviduct they are each fertilized at the opening of the sperm tube, and are covered with a layer of the cement substance before they pass out into the external sacks. In the latter they segment, and the larvae develop through the nauplius and metanauplius stages before hatching. Segmentation is entirely superficial, the cytoplasm separating from the yolk, migrating to the surface and there forming blastoderm cells around nuclear centers. The yolk remaining inside the egg and afterwards inside the embryo serves to nourish the latter not only through the nauplius and metanauplius stages but also through the free swimming copepodid stage. Since neither the nauplius nor the metanauplius can escape from the egg, their unfolding is necessarily condensed. Usually the three nauplius appendages develop and serve their temporaiy function before the other appendages

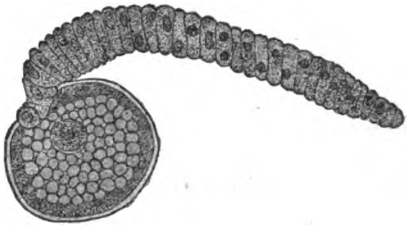

FIG. 10.—EGG FILAMENT AND DEVELOPING EGG IN CLAVELLA UNCINATA.

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[1] Proc. U. S. Nat. Mus., vol. 39, p. 189.

[2] Report of the Commissioners of Fisheries of Wisconsin, 1911-12, p. 11.

appear. But here in the Lernaeopodidae the mouth parts and the first two pairs of swimming legs appear simultaneously with the nauplius appendages, and they all develop together. The early larval stages are thus so thoroughly fused as to become virtually one single period, and the peculiarities which characterize the different stages overlap one another, several sometimes being present at the same time.

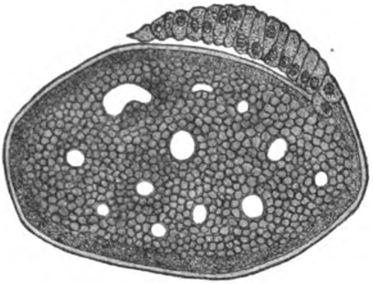

FIG. 11.—EGG FILAMENT AND DEVELOPING EGG OF CLAVELLISA CORDATA.

Understanding such a fusion, therefore, we may distinguish the following steps in development by dissecting some of the larvae out of their surrounding envelopes.

*Nauplius.*—Body ovate, the larger end anterior; two pairs of appendages visible, corresponding to the first and second antennae; first pair one-jointed, uniramose, terminating in two plumose setae; second pair biramose, exopod five-jointed, each joint with a long plumose seta, endopod two-jointed and terminated by two plumose setae; no balancers but the posterior portion of the body differentiated into a free thorax and a broad spatulate abdomen, which is curled over ventrally beneath the thorax; no eye visible but the anterior part of the head occupied by an attachment filament which forms a simple loop, extending from the frontal margin to the center of the head; behind this may be seen the yolk granules and on either side are the muscles that later will move the swimming legs.

FIG. 12.—EGG FILAMENT AND EGG OF NAOBRANCHIA LIZAE. FIGS. 10, 11, AND 12 ARE MAGNIFIED ALIKE.

*Metanauplius.*—Body so thick and stout as to be nearly spherical; first antennae three-jointed and tipped with two plumose setae; second pair with a five-jointed exopod, each joint with a plumose seta, and a two-jointed endopod, with two terminal setae and a stout claw at their base; upper lip elliptical, wider than long; mandible short, uniramose, and tipped with a single seta; first maxillae biramose at the tip, the outer ramus much shorter than the inner, and each armed with short spines; second maxillae stout, uniramose, three-jointed and terminated by a weak claw; maxillipeds also uniramose and three-jointed and terminated by a stouter claw.

Each of the four swimming legs consists of a basal joint and two one-jointed rami, armed with long plumose setae; the anal laminae are as large as the rami of the legs and carry long and unequal setae. The first actual molt takes place at the close of this metanauplius stage, and the escape from the egg is simultaneous with it.

*First copepodid or free-swimming stage.*—Body elongated, flattened dorso-ventrally and made up of a cephalothorax, three free thorax segments, and a fused genital segment and abdomen, carrying the anal laminae. The cephalothorax is a more (*Clavella*) or less (*Achtheres* and *Salmincola*) complete fusion of the head and first thorax segment. In the latter genera the separation of the two is indicated by notches on the lateral margins and by a dorsal groove; in the former genus these do not appear. The shape of this cephalothorax is elliptical in *Salmincola*, ovate in *Clavella*, and elliptical or subquadrilateral in *Achtheres*. A characteristic copepod eye is found at about the center of the cephalothorax in *Clavella* and *Salmincola*. The eye in *Achtheres* is so rudimentary that it can not be seen except in sections. In the front of the head, close to the dorsal surface, lies the attachment filament which is characteristic of this family. It consists of a long cylindrical rod, enlarged at either end; the enlargement of the distal end is in the shape of a mushroom or umbrella, and is the part that sticks to the flesh of the host, and becomes the bulla or attachment organ of the adult parasite. The cylindrical rod is folded in a single loop in *Salmincola*, coiled like a rope in *Achtheres*, and wound into a tight spiral in *Clavella* (fig. 13).

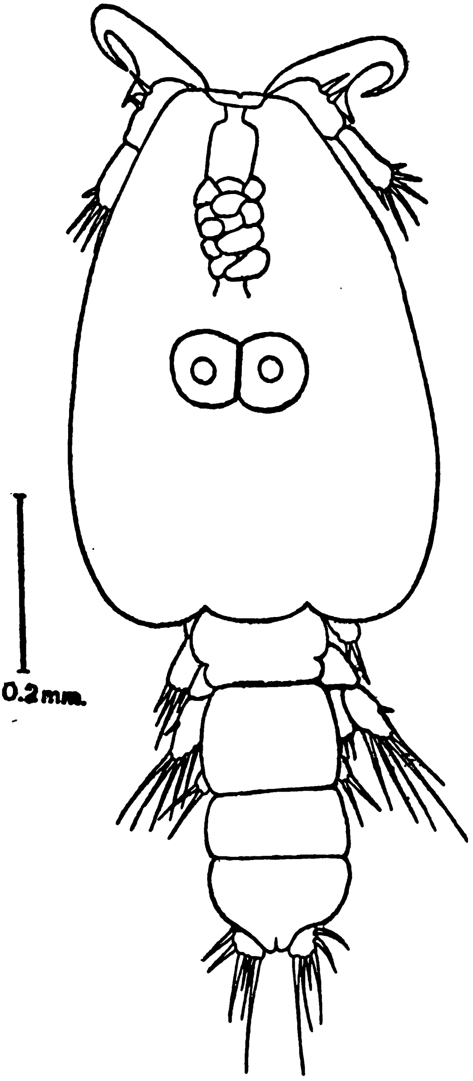

Fig. 13.—Copepodid larva of Clavella uncinata.

The first thorax segment is two-thirds as large as the head, is fused with the latter, and tapers posteriorly, terminating in two large lobes which correspond to the posterior lobes of the carapace in the Caligidae. The second (first free) thorax segment is much larger than the segments which follow it in *Achtheres* and *Salmincola*, but is the same size or a trifle narrower in *Clavella*. The third and fourth segments are about the same size and length in all the genera, but their relative size compared with the cephalothorax or with the second segment varies greatly. In general they are very narrow in *Achtheres* and *Salmincola* and very wide in *Clavella*. The last segment is a fusion of the posterior portion of the thorax and the abdomen, and it carries the anal laminae, which are variously armed with setae in the different genera. The first antennae are four-jointed and extend directly outward at right angles to the body axis in *Salmincola* and *Achtheres*; in *Clavella* they apparently have fewer joints and are turned backward along the sides of the carapace. The second antennae are biramose, the exopod one-jointed and tipped with a single seta, the endopod two-jointed and ending in a powerful hooked claw. The mouth-tube projects downward and forward from between the bases of the second antennae. It is made up of an upper and under lip, the latter grooved and fluted, overlapping the edges of the upper lip, and consisting of two halves, which are often not entirely fused. The mandibles are outside the base of the mouth-tube, one-jointed and tipped with short setae; the first maxillae are also uniramose but two-jointed and tipped with longer setae; the second maxillae are stout, two-jointed, and tipped with a long and slender claw, bent into a half circle; the maxillipeds are also stout, three-jointed, and tipped with a stouter and straighter claw (fig. 14). Swimming legs biramose, the basal joints broad and laminate, and furnished with powerful muscles, the rami small, one-jointed, and armed with long plumose setae (fig. 15).

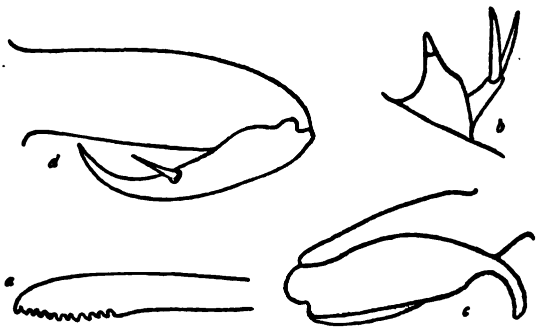

FIG. 14.—COPEPODID LARVA OF CLAVELLA UNCINATA. *a*, MANDIBLE; *b*, FIRST MAXILLA; *c*, SECOND MAXILLA; *d*, MAXILLIPED.

As soon as this copepodid larva escapes from the egg it begins an active search for a host. By means of its two pairs of swimming legs it moves about actively in a more or less spiral path.[1] This movement is kept up for 24 to 48 hours, and then relaxes, the larva becoming so wearied that it can scarcely move at all. Consequently it must find a host within this time or perish; if it is fortunate enough to come in contact with the right kind of fish it fastens itself at once to it. It is a general rule that every species of fish has its own peculiar parasites, and hence the latter must have some means of selecting the right host. It is also true that the more fixed the parasite becomes and the less capable it is of moving about, the more exclusively is it confined to one species of fish.

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[1] Fasten, Journ. Animal Behavior, vol. 3, 1913, p. 43.

It is only the free-swimming forms like *Argulus* and some of the Caligidae that have a long list of hosts. Eyesight probably has very little to do with the selection of the particular host, especially in the present family, where the eyes are so rudimentary as to be practically useless.

Fasten's experiments with *Salmincola edwardsii*, together with repeated observations by the present author, would indicate that the choice is made by some chemical means, smell or taste, or a combination of the two. Actual attachment is accomplished by bringing the frontal margin of the head in contact with the skin, fin, or gill of the host. The mushroom end of the attachment filament then sticks fast, and the filament is withdrawn from the head. In *Salmincola*, according to Fasten, the larva remains a short time attached by the frontal filament; in the other genera such an attachment has not yet been observed. But in any case this attachment lasts only a short time; the proximal end of the filament is grasped by the second maxillae and detached from the frontal margin of the head. The maxilla and filament are then thoroughly fused, and remain as the so-called arms or permanent attachment organs of the adults of this family of parasites. There is always an absorption of the filament, and there may be also an absorption of the maxillae until all that is left of the original apparatus is the distal mushroom enlargement of the filament, the bulla, buried in the flesh of the host. Many species of *Clavella* show such a condition, the bulla being fastened directly to the ventral surface of the trunk. On the other hand, after the filament has been absorbed the arms sometimes lengthen until they may become two or three times the length of the entire body, as in *Lernaeopodina*.

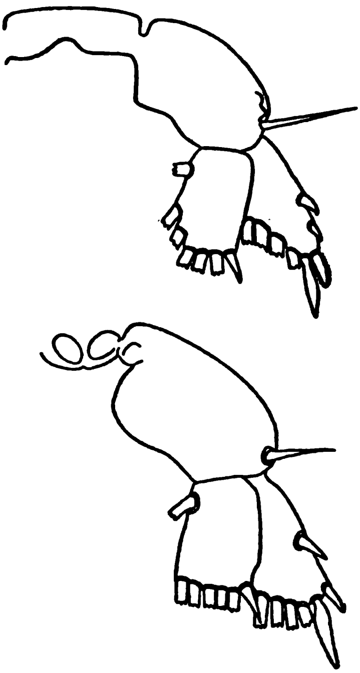

FIG. 15.—FIRST (UPPER) AND SECOND SWIMMING LEGS OF COPEPODID LARVA OF CLAVELLA UNCINATA.

The male does not become permanently attached in this way, but retains his hold on the filament for a short time only and then lets go and clings to the body of the female for the rest of his life. Subsequent to attachment the changes which take place in the copepod are chiefly concerned with the development of the reproductive organs. In the fixed female the legs, the segmentation of the body, and frequently the anal laminae disappear. At the same time the trunk or so-called genital segment increases through the development of the convolutions of the oviducts and becomes relatively as well as actually much larger than before, and finally the external egg sacks are formed, which may be regarded as the completion of the life cycle.

The male does not increase much in size, but remains a pygmy; he usually loses the two pairs of swimming legs, but retains, in part at least, the body segmentation. The maturing of the spermatophores and their subsequent attachment to the genital process of the female marks the completion of his life cycle, and he does not probably live very long afterwards.

## SYSTEMATIC.

*Historical.*—In the first edition (1735) of his Systema Naturae Linnaeus placed all the crustaceans among the wingless insects under three genera. It is very doubtful if any member of the present family was included in this first edition. But later in the second edition of the Fauna Suecica (1761) he described *Lernaea salmonea,* which is really a Lernaeopod and probably the oldest member of the family, and which he located among the mollusks.

Having thus begun under the genus *Lernaea,* the present family was for a long time included with the Lernaeidae. On account of their degenerate form they were not placed with the crustacea by any of the earlier zoologists. Lamarck, after locating them among the mollusks (1801) and the annelids (1809) went so far as to create a separate group to receive them (1812) which he called the Epizoaria and placed between the worms and the insects. In his Handbuches der wirbellosen Thiere (1816) he writes that he had found Lerneans which showed a transition from insects to worms so that the Epizoaria could be regarded only as a provisional or temporary class.

Bosc, also following Linnaeus, placed them among the mollusks (Historia Vermium, n. d.), but contended that they were closely related to the intestinal worms. Oken, in his Lehrbuch der Naturgeschichte (1815–16), included some of the Lernaeopodidae in two different places. First he placed among the worms (pp. 182–184), between *Echinorhynchus* and *Hamularia,* the genera *Philline, Schisturus,* and *Lernaea.* Second as a separate group, the Armwürmer (pp. 357–359), between *Asterias* and *Gordius,* he placed not only *Axine, Clavella, Pennella,* and *Lernaea,* but also *Dichelesthium, Caligus,* and *Argulus*. But while locating them thus wrongly, he at the same time pointed out their close relationship to the Entomostraca, and thus made a notable advance over his predecessors. De Blainville published in the Bulletin des Sciences, Paris, 1816, a new classification of the animal kingdom in which he placed the Lernaeopodidae with other copepod parasites, in a subclass Epizoaires under the class Tetradecapods and the group Articulates. Later he made a special study of the Lernaeidae and gave (Journal de Physique, 1822) the first good account of their anatomy. He divided the family into a large number of new genera, which he arranged according to their morphology and the nearness with which they approached *Caligus*. The seventh of these was the new genus *Lernaeopoda*, the type of the present family. Latreille in Cuvier's Règne Animal keeps the Lernaeans among the intestinal worms even as late as 1830.

He admits that other authors have claimed that these parasites are crustacea, as is shown by the males, but he adds, "pour consacrer cette opinion, il foudrait pouvoir rétrouver ces mâles" (vol. 3, p. 256). He introduces with Oken's *Clavella* the new genera *Anchorella* and *Brachiella*, which belong to the Lernaeopodidae and are of course ascribed to Cuvier. In 1831 he published a Cours d'Entomologie in his own name wherein he described the Siphonostoma as an order of the section Edentata of the class Crustacea. He calls the second family of this order Lernaeiformes, but does not include in it any of the Lernaeidae, thus failing to recognize their relationship with the Siphonostomata and other crustacea.

Desmarest, in his monograph of the crustacea (1825), after showing that the Lernaeidae belong with the Caligidae among the crustacea, finally places them under the Poecilopoda, an order of the subclass Entomostraca. Wiegmann, in his Grundriss der Zoologie (1823), was the first to give the Lernaeidae their proper position, partly agreeing with Blainville, partly with Desmarest, and partly with other German investigators like Nitzoch and Leuckart. He was followed by Nordmann (1832) and Burmeister (1833), who confirmed the position assigned to the Lernaeidae, and added many of the facts necessary to confirm their views. Nordmann established the new genera *Achtheres*, *Basanistes*, and *Tracheliastes*, and described new species in several of the old genera. Burmeister at the close of his paper adds some general considerations in which he gives us the first division of the group Siphonostoma into five families. The second of these, the Lernaeoda, corresponded almost exactly with the modern family Lernaeopodidae, but included, beside the true Lernaeopod genera, *Chondracanthus* and *Lernanthropus*.

Milne Edwards was thus furnished with a large amount of necessary data which enabled him in his great work, Histoire Naturelle des Crustacés (1840), to perfect the classification of the parasitic copepods in many particulars. He recognized two orders, the Siphonostoma, including the Argulidae, the Caligidae, the Pandaridae, the Dichelestiidae, and the Ergasilidae, and for the second order the Lernaeidae, including the Chondracanthidae, the new family, the Lernaeopodidae, and the Lernaeoceridae.

The family was thus first introduced by Milne Edwards, and since that introduction the only changes in it have been the addition or removal of various genera.

## Family LERNAEOPODIDAE Milne Edwards.

*Family characters of female.*—A fixed parasite; head usually separated from the thorax, often borne on a long neck; trunk usually unsegmented, with or without posterior processes; abdomen and anal laminae often lacking; first antennae small and with few joints; second antennae biramose, flattened laterally, not prehensile; upper and under lips prolonged into a sucking tube fringed with hairs; mandibles toothed; first maxillae rudimentary, palplike; second maxillae modified into attachment organs, usually joined at the distal end and furnished with a bulla; maxillipeds of the usual prehensile form, tipped with claws; no swimming legs; egg strings large, multiseriate.

*Male.*—A pigmy clinging to the body of the female but free to move about; head usually separated from the trunk, the latter more often segmented than in the female; anal laminae usually present; first maxillae similar to those of female; second maxillae and maxillipeds large and powerful, and furnished with prehensile claws; first two pairs of swimming legs sometimes present in the adult (genus *Achtheres*), but degenerate and useless.

*Remarks.*—The different investigators have adopted very different methods of classification in dealing with this family. Burmeister (1833) used the structure and position of the attachment organs (Haftorganen) as the basis of the first division, and the length and shape of the cephalothorax as the basis of the second division. Milne Edwards (1840) used the same basis for his first division, but for the second one he introduced the relative position of the second maxillae and maxillipeds.[1] Baird (1850) used the structure and fusion of the second maxillae for his first and only division, which is really a generic one, since he included in the family simply the two genera *Lernaeopoda* and *Anchorella*. Heller (1865) based his first division on the presence or absence of maxillipeds, his second on the structure of the second maxillae, and his third on the form of the cephalothorax. Gerstaecker (1881) used the length and thickness of the cephalothorax for his first division, the separation or fusion of the neck and body for the second division, and the structure of the attachment organs for the third division.

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[1] He called them first and second maxillipeds.

Since Gerstaecker there has been no serious attempt at a revision of the classification of this family, though valuable suggestions have been made by Neresheimer (1909) and others.

The following scheme of classification is a combination of all these which have preceded it, with such additions as more recent investigations demand. The most important of these additions and the one thing which can give the present scheme any credit, if indeed it can claim such, is the use of the male. The males are less degenerate than the females and the only reason why they have not hitherto been employed by systematists has been the fact that so few of them have been known. Nearly every investigator has called attention to the desirability of the male as a basis of generic distinction. Some have plainly stated that the ultimate decision in every question of generic validity must rest with the male. This being appreciated even by those who lacked the facts necessary to use it, it follows that type distinctions among the males ought to possess superior value in distinguishing the genera. Accordingly, so far as has been possible in the following classification, each genus presents a certain type of male, which is fully described and figured in the genus diagnosis. To facilitate comparison these 17 male types are shown side by side in plates 25 to 28, the scale mark by the side of each representing one-tenth of a millimeter.

### TABLE OF GENERA.

1. Maxillipeds inside of second maxillae and the two close behind the mouth tube; cephalothorax neither narrowed nor flattened, in line with the trunk or inclined forward.........................................LERNAEOPODINAE, 2.

1. Maxillipeds inside of second maxillae and the two removed a considerable distance behind the mouth tube; cephalothorax much narrowed and flattened, inclined backward, or arched dorsally..................TRACHELIASTINAE, 5.

1. Maxillipeds removed some distance behind the mouth tube, second maxillae an equal distance behind the maxillipeds; cephalothorax neither narrowed nor flattened, in line with the second maxillae and at right angles to the trunk axis.................................................BRIANELLINAE, 6.

1. Maxillipeds close to the mouth tube, second maxillae removed a considerable distance behind them; cephalothorax narrowed and wormlike, in line with the trunk axis or inclined backward.......................CLAVELLINAE, 7.

2. Second maxillae much longer than the cephalothorax; the latter always separated from the trunk by a well-defined groove and often by a sort of neck........ 3.

2. Second maxillae stout and but little longer than the cephalothorax; the latter fused with the body, without any traces of separation or segmentation...... 4.

3. No dorsal carapace on the cephalothorax; a genital process but no anal laminae, posterior processes, or abdomen; trunk stout and unsegmented.
*Salmincola*, new genus, p. 603.

3. A partial dorsal carapace; no anal laminae or posterior processes, but a distinct abdomen, sometimes segmented; trunk also often partially segmented; male type *A*, pl. 25.............................*Achtheres* Nordmann, 1832, p. 617.

3. A distinct dorsal carapace; second and third thorax segments more or less differentiated; no genital process nor anal laminae; two posterior processes ventral to the egg strings; male type *B*, pl. 25....*Lernaeopoda* Blainville, 1822, p. 631.
3. A distinct dorsal carapace; trunk unsegmented; no genital process nor anal laminae; two posterior processes dorsal to the egg strings; male type *D*, pl. 25. *Lernaeopodina*, new genus, p. 639.
4. Fused head and trunk covered with longitudinal rows of knobs or tubercles; male unknown..................................*Basanistes* Nordmann, 1832, p. 643.
4. Fused head and trunk smooth, without tubercles or knobs; male type *N*, pl. 28. *Vanbenedenia* Malm, 1860, p. 644.
5. Cephalothorax distinctly separated from the trunk; second maxillae united at the tip and furnished with a bulla; male unknown. *Tracheliastes* Nordmann, 1832, p. 644.
6. Second maxillae shorter than the cephalothorax, three-quarters fused and with branching horns instead of a bulla; mouth tube depressed; male unknown. *Brianella*, new genus, p. 647.
6. Second maxillae twice as long as the cephalothorax, entirely separate and with an ordinary bulla; mouth tube projecting prominently; male unknown. *Thomsonella*, new genus, p. 649.
7. Trunk, or second maxillae, or both, with deeply incised, fimbriate processes; cephalothorax in line with the trunk.................................... 8.
7. No fimbriate processes on either the trunk or the second maxillae; cephalothorax inclined to the trunk..................................................... 9.
8. Cephalothorax short, thickset, and straight; anterior fimbriate processes on the second maxillae; posterior ones on the posterior margin of the trunk; male type *G*, pl. 26.................................*Thysanote* Krøyer, 1863, p. 650.
8. Cephalothorax long, slender, and curved; both sets of processes entirely separate from the second maxillae and the posterior margin; male type H, pl. 26. *Thysanotella*, new genus, p. 651.
9. Cephalothorax short and stout, in line with the trunk, the two separated by a distinct and very narrow neck; second maxillae entirely fused, with a bulla; no genital process, anal laminae, or posterior processes; male unknown. *Cauloxenus* Cope, 1872, p. 665.
9. Cephalothorax short and stout, flexed backward; second maxillae entirely separate, each ending in a clasping enlargement; no bulla, genital process, or anal laminae; two small posterior processes, dorsal; male type I, pl. 26. *Charopinus* Krøyer, 1863, p. 652.
9. Cephalothorax elongate and wormlike, curved or flexed at an angle with the trunk; second maxillae in the form of broad clasping muscle bands; no bulla, genital process, or posterior processes, but an unsegmented abdomen with anal laminae; male type J, pl. 27 .................*Naobranchia* Hesse, 1863, p. 657.
9. Cephalothorax elongate and wormlike, flexed at an angle with the trunk; second maxillae normal and furnished with a bulla............................. 10.
10. Second maxillae short and completely fused, often entirely lacking; a genital process, but no abdomen or anal laminae, and usually no posterior processes. 11.
10. Second maxillae long and separate to their tips; a genital process and from two to six posterior processes, but no abdomen or anal laminae.................. 12.
11. Second antennae uniramose, turned down across the frontal margin; first maxillae bipartite; first antennae three-jointed; male type M, pl. 27. *Clavella* Oken, 1815, p. 666.
11. Second antennae biramose, turned down across the frontal margin, ventral ramus two-jointed; posterior processes sometimes present; first maxillae bipartite; first antennae four-jointed; male type, K, pl. 27....*Clavellopsis*, new genus, p. 686.

11. Second antennae biramose, turned down across the frontal margin, ventral ramus unsegmented; first maxillae tripartite; first antennae three-jointed; male type L, pl. 27 .................................. *Clavellodes*, new genus, p. 689.
11. Second antennae biramose, projecting forward, ventral ramus unsegmented; first antennae very large, four-jointed, projecting forward and often armed with large spines; first maxillae bipartite; male type E, pl. 26. *Clavellisa*, new genus, p. 693.
12. No posterior processes; no dorsal carapace; both rami of second antennae unsegmented; male type P, pl. 28.................. *Eubrachiella*, new genus, p. 716.
12. Two or four posterior processes; a distinct dorsal carapace; exopod of second antennae two-jointed .................................................. 13.
12. Six or eight posterior processes; no genital process; cephalothorax flexed forward, not backward.......................................................... 14.
13. Cephalothorax separated from the trunk by a distinct groove; first maxillae bipartite; second maxillae with fingerlike processes or with a club-shaped bulla; male type O, pl. 28......................... *Parabrachiella*, new genus, p. 713.
13. No groove between the cephalothorax and trunk; first maxillae tripartite; second maxillae without processes or with an ordinary button-shaped bulla; male type C, pl. 25.................................. *Brachiella* Cuvier, 1830, p. 698.
14. No dorsal carapace; exopod of second antennae two-jointed; second maxillae separate to their tips; first maxillae bipartite, palp with two spines; male type F, pl. 26.............................. *Epibrachiella*, new genus, p. 715.
14. A distinct dorsal carapace; both rami of second antennae unsegmented; second maxillae completely fused; first maxillae tripartite, no palp; male type R, pl. 28................................ *Probrachiella*, new genus, p. 716.

*Synonyms.*—The mouth parts being difficult to discern while the swimming legs are entirely lacking, the old investigators were compelled to depend largely upon the general form, the external appearance, and the egg strings. These features are changeable enough at their best, but when we reflect that practically every specimen described by those investigators had been preserved in strong alcohol we wonder that they located so many of them correctly. The alcohol warps and distorts the soft and unresisting tissues, wrinkles the skin, changes or bleaches out the color, and shrinks the bodies. In view of these facts it is not surprising that the same animal in three or four different kinds of preservation has served as the type of as many distinct species or even genera. In consequence there are very few of the genera which do not have at least one synonym, while some of them have as many as four. The following is a list of the synonyms as at present recognized:

*Pediculus.*—Baird in his British Entomostraca says: "the first notice taken of any species appertaining to the genus [Lernaeopoda] was by Gisler in 1751, who, in the twelfth volume of the 'Acta Suecica,' describes and figures a species of *Lernea* found by him on the salmon, and which he called '*Pediculus salmonis* or *Lax-lusen*'". There is no twelfth volume, 1751, of the Acta Suecica, but in vol. 12, 1751, of Kongl. Svenska Vetenskaps Academiens Handlingar, p. 185, Nils Gissler described "Lax-lusen," but did not mention *Pediculus*. Hence the name must be dropped, especially as it was afterwards used by Linnaeus for a genus of Epizoa.

*Schisturus.*—This name was applied by Rudolphi in 1809 to a genus of worms, and by Oken in 1815 to a single species of the genus *Clavella.* In this latter use it becomes a synonym.

*Entomoda.*—Applied by Lamarck in 1818 to the genus *Lernaeopoda;* but as the type or first species named by Lamarck under his new genus was *E. cornuta,* which belongs to the genus *Chondracanthus,* established in 1811, it is evident that the name can not be used for a Lernaeopod.

*Anchorella.*—Proposed by Cuvier in 1830 for a single Lernaean which he wished to establish as a new genus, and afterwards applied by other authors to the entire genus *Clavella,* excluding the latter name. But the name *Clavella* had been published by Oken in 1815 and hence *Anchorella* is either a distinct genus or becomes a synonym (see p. 667).

*Lernaeomyzon.*—Proposed by Blainville in 1822 for this same genus *Clavella,* but the latter had seven years' precedence.

*Hessia.*—In 1870 Edouard van Beneden published a paper [1] entitled "Developpement des genres *Anchorella, Lernaeopoda, Brachiella,* et *Hessia.*"

No description of this last-mentioned genus is given, nor any figures except of the eggs and one larval stage. Beneden says of it that it approaches on the one side *Anchorella,* which it resembles in all the phenomena of development, while on the other hand it is like certain of the Chondracanthidae in its external appearance; that it is a very common parasite along the coast of Brittany in the gill cavity of *Trigla lineata.* It may be the same species that Richiardi afterwards designated as *Anchorella carusi.* But he also has given us no description or figures; hence both designations become mere names until something further is known about them.

*Cestopoda.*—Kurz in his admirable paper on the Lernaeopodidae (1877) described and figured a new genus and species which he designated as *Cestopoda amplectens.* But 14 years before Hesse had described a new genus and species which he called *Naobranchia cygniformis.* The two genera are identical, although the species are distinct, and hence Kurz's name must become a synonym of that given by Hesse.[2]

*Stylophorus.*—In 1878 Hesse published the description and figures of another new genus and species which he called *Stylophorus hippocephalus.* But on examination this proves to be the same genus that Krøyer had designated as *Charopinus* in 1863. Hence Hesse's name must become a synonym of Krøyer's.

*Thynnicola.*—Miculicich in 1904 described what he thought to be a new genus and species under the name *Thynnicola ziegleri,* but which proved to be the same that Cuvier had named *Brachiella thynni.* The former thus becomes a synonym of the latter name.

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[1] Bull. Acad. Roy. Belgique, ser. 2, vol. 29, p. 223.

[2] Annales des Sciences Naturelles, ser. 4, vol. 20, p. 101, pl. 1.

### LERNAEOPODINAE, new subfamily.

*Subfamily characters of Female.*—Cephalothorax shorter than the arms, and in line with the body or bent forward at an angle; trunk plump, sometimes with, sometimes without, posterior processes, but often showing more or less distinct segmentation; a genital process in some genera but no anal laminae; second maxillae outside of maxillipeds and the two close behind the base of the mouth tube; the maxillae united only at the tips, sometimes entirely separate; bulla, when present, of the ordinary type; egg strings usually short and plump.

*Male.*—Cephalothorax separated by a well-marked groove from the body, which is often segmented; anal laminae present and usually directed backward; second antennae biramose and armed with a claw.

### SALMINCOLA, new genus.

*Generic Characters of Female.*—Cephalothorax short, stout, and inclined at an angle to the body axis; separated from the trunk by a groove, but with no definite waist; no dorsal carapace; trunk short and stout, often flattened dorso-ventrally, with no signs of segmentation; no abdomen, anal laminae, or posterior processes; a small transparent genital process is present in the young female and often in the adult. First antennae indistinctly three-jointed, usually showing no segmentation; second antennae biramose, both rami one-jointed, the endopod larger than the exopod; first maxillae tipped with three spines and without a palp; second maxillae short and stout, joined at the tip by a button or mushroom-shaped bulla, often joined also at the base around the back of the thorax, forming a pair of "shoulders;" maxillipeds with a stout basal joint and a slender terminal claw; egg strings usually long and slender, eggs small and numerous.

*Generic characters of male.*—Size small (0.50 mm.); cephalothorax about the same length as the trunk, the two bent into the form of a semicircle; no dorsal carapace; trunk a little stouter than the cephalothorax and indistinctly segmented, with a pair of short anal laminae curved dorsally; no abdomen; first antennae three-jointed; second antennae biramose, the exopod (ventral ramus) uncinate; second maxillae and maxillipeds each three-jointed, attached to the concave margin of the semicircle at the center, their tips reaching the same level as the tips of the antennae and the anal laminae; maxillipeds stouter than the second maxillae and attached inside the bases of the latter.

*Type.*—*Salmincola salmonea* (*Lernaea salmonea* Gissler).

(*Salmincola, Salmo,* the host family and *incola,* a dweller.)

*Remarks.*—This new genus differs from *Lernaeopoda* in the absence of a dorsal carapace on the cephalothorax, in the fact that the first thorax segments are not differentiated, in the absence of posterior processes and a palp on the first maxillae, and in the presence of a genital process. From *Lernaeopodina* it may be distinguished by the absence of a dorsal carapace, posterior processes, and the palp on the first maxillae, by the presence of a genital process, and by the structure of the maxillipeds.

From *Achtheres* it may be separated by the configuration of the top of the head (see figs. 19 and 69), by the absence of a neck and abdomen, by the presence of a genital process, and by the form of the second antennae, which are folded across the front of the head in *Achtheres,* but are carried straight forward in *Salmincola.*

The only male of the genus thus far discovered is that of *edwardsii* which has recently been described and figured by Fasten.[1]

It shows a much closer relationship to *Achtheres* than to *Lernaeopoda,* but may be distinguished by its smaller size, by the curvature of the cephalothorax and trunk, and by the structure of the second antennae.

### TABLE OF SPECIES.

1. Body two or three times as long as the cephalothorax and much wider, flattened dorso-ventrally and not inflated.......... 2.
1. Body and cephalothorax of about the same length, trunk wider and considerably inflated, sometimes spherical; arms much shorter than the trunk and with a petioled bulla.......... 7.
2. Cephalothorax as wide or wider than long and nearly in line with the trunk.... 3.
2. Cephalothorax much longer than wide and at right angles to the trunk axis.... 6.
3. Arms straight and considerably longer than the trunk.......... 4.
3. Arms more or less curved and shorter than the trunk.......... 5.
4. Bulla funnel-shaped; two chitinous appendages between the bases of the first maxillae.......... *alpina* (Olsson), 1877.
4. Bulla mushroom-shaped; body much flattened, thinner posteriorly than anteriorly.......... *californiensis* (Dana), 1852, p. 605.
4. Bulla orbicular with a long petiole; maxillipeds large and stout, without accessory spines.......... *carpionis* (Krøyer), 1837, p. 606.
5. Bulla scoop-shaped, with its concave ventral surface applied to the outside of the gill filament; maxillipeds with accessory peg on ventral surface of basal joint.......... *salmonea* (Gissler), 1751, p. 607.
5. Bulla pear-shaped; maxillipeds with a minute tooth on the inner margin of terminal joint.......... *coregonorum* (Kessler), 1868.
6. Bulla mushroom-shaped and petioled, arms longer than the trunk; maxillipeds plainly visible, with a large papilla on the basal joint *siscowet* (Smith), 1874, p. 608.
6. Bulla mushroom-shaped and petioled; arms longer than the trunk and covered with a "vagina;" maxillipeds concealed between the arms and without papillae.......... *lotae* (Olsson), 1877.

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[1] Biol. Bull., vol. 27, p. 116, pls. 1-3.

6. Bulla globular and sessile; arms much shorter than trunk; maxillipeds plainly visible, very large, destitute of claws; trunk contracted anteriorly into a neck.................................................*maraenae* (Olsson), 1877.
6. Bulla spherical and sessile; arms longer than trunk; maxillipeds plainly visible, slender, bearing claws; trunk spool-shaped and much elongated.
*extensa* (Kessler), 1868.
7. Dorsal outline of head elongate with concave sides; maxillipeds with accessory spines on basal or terminal joints, or both.............................. 8.
7. Dorsal outline of head broadly ovate with convex sides; maxillipeds without accessory spines and often without claws.............................. 10.
8. Bulla mushroom-shaped with enlarging pedicel; maxillipeds plainly visible, but only reaching the base of the mouth tube; first maxillae with palp.
*edwardsii* (Olsson), 1869, p. 609.
8. Bulla conical with enlarging pedicel; maxillipeds visible and reaching anterior margin of head; first maxillae without a palp and with 2 setae.
*oquassa*, new species, p. 611.
8. First maxillae without a palp but with 3 terminal setae; maxillipeds of varying lengths.............................................................. 9.
9. Bulla mushroom-shaped with two distinct pedicels; maxillipeds wholly visible, with a large spine on the basal joint; egg tubes widely separated at their base,
*bicauliculata* (Wilson), 1908, p. 612.
9. Bulla mushroom-shaped, only one pedicel; maxillipeds partly hidden; no spine on basal joint; egg tubes close together at their base.
*falculata* (Wilson), 1908, p. 613.
9. Bulla club-shaped, five times as long as wide; maxillipeds completely hidden between the arms; the latter short and much swollen.
*thymalli* (Kessler), 1868, p. 613.
10. No terminal claws on maxillipeds; egg tubes turned forward and curled against the trunk; diameter of bulla much greater than that of the arms............ 11.
10. Small terminal claws present on maxillipeds; egg tubes long and slender and in normal position; diameter of bulla about the same as that of the arms........ 12.
11. First antennae two-jointed; exopod of second pair a segmented papilla; first maxillae short and stout; toothed edge of mandible continuous and uninterrupted.
*inermis* (Wilson), 1911, p. 614.
11. First antennae unsegmented; exopod of second pair a claw; first maxillae long and slender; toothed edge of mandible with a wide gap near the center.
*extumescens* (Gadd), 1901.
12. Cephalothorax in line with trunk; basal joint of maxilliped very slender; exopod of second antenna distinctly jointed; no accessory spine on maxillipeds.
*arcturi* (Miers), 1877.
12. Cephalothorax at an obtuse angle with trunk; basal joint of maxillipeds stout and armed with accessory spine; exopod of second antenna not jointed.
*beani* (Wilson), 1908, p. 615.
12. Cephalothorax at right angles to trunk; bases of arms forming a pronounced hump across back of head; terminal claw of maxillipeds large.
*gibber* (Wilson), 1908, p. 615.
12. Cephalothorax at right angles to trunk; no pronounced hump; no claw on maxillipeds.................................... *carpenteri* (Packard), 1874, p. 616.

### SALMINCOLA CALIFORNIENSIS (Dana).

*Lernaeopoda californiensis* DANA, 1852, p. 1379, pl. 96, figs. 1*a* and 1*b*.

Plate 29, figs. 16 and 17.

*Host and record of specimens.*—Several females were taken from the body of a salmon (*Oncorhynchus*) in the Klamath River, California, by the Wilkes Exploring Expedition. Four females were collected by Dr. B. W. Evermann from the gills of *Oncorhynchus nerka* at the inlet of Big Payette Lake, Idaho, September 27, 1894. These were identified by G. G. Gurley, and from them he obtained the measurements given below. Unfortunately none of these specimens appear in the United States National Museum collection.[1]

*Specific characters of female.*—Cephalothorax in line with the trunk axis, triangular in outline, one-third the length of the trunk, nearly twice as wide as long, with rounded corners. Trunk elliptical, at the center nearly twice as broad as the head, drawn to a rounded point posteriorly between the egg strings. In lateral view both the head and the trunk are flattened into a continuous straight line on the ventral surface, but very convex dorsally. The trunk is thickest anteriorly and the cephalothorax posteriorly, and each tapers rapidly toward the opposite extremity. Egg strings slender, cylindrical, and one-half longer than the trunk; eggs in 8 or 10 longitudinal rows, about 30 in a row. Second maxillae short and stout and much wrinkled, joined to the bulla by a long and slender pedicel; bulla mushroom-shaped, its diameter considerably greater than that of the maxillae themselves; maxillipeds short and slender.

*Male.*—Unknown.

Color (preserved material), a uniform grayish white. Total length, 3.5 mm.; breadth, 2.8 mm.; length of arms, 2.72 mm.; length of bulla pedicel, 0.95 mm.; length of egg strings, 4.36 mm.

(*californiensis*, from the locality in which it was found).

*Remarks.*—In support of his identification Gurley notes the fact that *Oncorhynchus nerka*, from which Doctor Evermann obtained his specimens, is the species which occurs in the Klamath River, where Dana's types were found. The species seems to be a valid one, although there are no specimens of it now available. For this reason and because Dana's figures are not readily accessible they are reproduced here (pl. 29, figs. 16 and 17) somewhat enlarged, but otherwise just as he published them.

### SALMINCOLA CARPIONIS (Krøyer).

*Lernaeopoda carpionis* KRØYER, 1837, p. 268, pl. 2, fig. 6.

*Remarks.*—Krøyer distinguished this species from *salmonea* as follows, a distinction which Bassett-Smith and others have tried to set aside.

> *Salmonea*, head small, less than a fourth the length of the animal, subtriangular, of the same length and width, directed straight forward or a little backward. Arms elongate, equaling or exceeding the length of the trunk and making an obtuse angle with it; bulla recumbent, depressed, oval, yellow, subcartilaginous, and without a pedicel. External egg sacks short, slender, almost filiform, with two transverse series of eggs at the most.

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[1] Eight females have since been taken from the same host and locality; they have received Cat. No. 43563, U.S.N.M., and will be more fully described later.

*Carpionis*, head large, more than a fourth the length of the animal, ovate, much longer than wide, making with the trunk a right angle or one a little acute. Arms shorter than the trunk, often pressed against the surface of the underlying segment; bulla large, orbicular, very convex, black, horny, with an elongate and slender pedicel. External egg sacks of medium size with three or four transverse rows of eggs.

In Krøyer's figures there are also decided differences in the structure of the maxillipeds and second antennae, which make his specific distinction a valid one, and accordingly the two species have both been placed in the new genus *Salmincola*.

### SALMINCOLA SALMONEA (Gissler).

Plate 29, figs. 18 to 22.

*Lax-lusen*, *Lernaea salmonea* Gissler,[1] 1751, p. 185, pl. 6, figs. 1–5.
*Lernaea salmonea* Linnaeus, 1761, p. 509, No. 2102.
*Schisturus salmoneus* Oken, 1816, p. 183.
*Entomoda salmonea* Lamarck, 1818, p. 686.
*Lernaeopoda salmonea* Blainville, 1822, p. 443.

*Host and record of specimens.*—Three females with egg strings from the gills of a salmon at Bamffshire, England, were obtained by exchange from Canon A. M. Norman, and are numbered 8339, U.S.N.M.

A second lot of six females was obtained by R. Hitchcock from the gills of salmon in England and is numbered 39608, U.S.N.M.

*Specific characters of female.*—Cephalothorax short and stocky, three-lobed in dorsal view, being enlarged posteriorly through the bases of the second maxillae; separated from the trunk by a distinct groove; no dorsal carapace. Trunk a flattened ovoid or pyriform, narrowed anteriorly into a short neck, considerably enlarged and often somewhat three-lobed posteriorly, with a minute genital process at the center of the median lobe; no abdomen, anal laminae, or posterior processes.

First antennae short and tipped with a minute spine; no external indication of segmentation. Second antennae biramose; exopod longer and larger than the endopod and tipped with a large curved spine and two or three smaller ones; both rami one-jointed.

First maxillae slender and tipped with three small jointed setae, no palp; second maxillae, including the bulla, the same length as, or slightly shorter than, the entire body, joined at the tip to a large ovate bulla, sometimes by a single pedicel, sometimes by two distinct pedicels. Bulla as wide as both maxillae together, concave ventrally, convex dorsally, thickened and projecting back of the pedicel along the proximal margin. This bulla is turned down so that its long axis is parallel with that of the maxillae and its concave ventral surface is applied to the outside of the gill filament, instead of being buried in its tissue.

Maxillipeds with a stout basal joint and a short, slender, curved claw; the latter with an accessory spine near the center of its inner margin; the former with a short and stout spine or peg on its ventral surface near the base of the terminal claw. This spine is not in line with the terminal claw but the latter shuts past it dorsally.

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[1] Kongl. Svenska Vetenskaps Academiens Handlingar, vol. 12.

*Male.*—Unknown. Color a uniform yellowish-white; bulla bluish or light purple. Total length (without egg strings) 7 to 8 mm.; breadth, 3 mm.; length of arms, 5 mm.; of bulla, 1.5 mm.; of egg strings, 6 mm.

(*salmonea*, of or pertaining to salmon).

*Remarks.*—This species has been described by so many authors that very little is left to be added. Attention, however, is called to the fact that the median projection at the posterior end of the body is not an abdomen but a genital process like that in *Clavella*. Also the "two apical knobs" mentioned by some authors are really spermatophores (see fig. 22). The bulla is very peculiar in its application to the gill filament, as well as in its shape and orientation. The peculiar pattern of the dorsal surface of the head is a good characteristic of the species, and this with the bulla affords a ready means of identification. These points, together with the peg on the maxillipeds, are the chief reasons for presenting the figures here given.

### SALMINCOLA SISCOWET (Smith).

Plate 30, figs. 23 to 29.

*Lernaeopoda siscowet* SMITH, 1874, p. 664, pl. 3, figs. 15–16.

*Host and record of specimens.*—Seven adult females with egg strings were taken from the gills of *Cristivomer namaycush siscowet* at Outer Island, Lake Superior, by J. W. Milner. They are numbered 39597, U.S.N.M. and are labeled in Professor Smith's handwriting "*Lernaeopoda siscowet* Smith, Cotypes."

*Specific characters of female.*—Cephalothorax ovate, flattened dorsoventrally, coming to a rather sharp point anteriorly, and thickened posteriorly through the bases of the arms so that it overhangs considerably the trunk, from which it is separated by a very distinct groove. Dorsally the cephalothorax is strongly arched, while ventrally the large maxillipeds stand out prominently, like an under jaw. Trunk pear-shaped, considerably narrowed anteriorly, but not forming a distinct neck; only a little longer than wide, with obscure segmentation grooves on the ventral surface; strongly arched dorsally and truncated posteriorly, but ventrally extending a little back of the bases of the egg strings.

The latter are cylindrical and as long as the entire body or longer; eggs in 6 or 7 longitudinal rows, much twisted, about 30 eggs in each row.

First antennae of medium length and tipped with 2 or 3 minute spines, but very obscurely segmented; second pair biramose, the exopod one-jointed, longer than the endopod, enlarged a little at the tip and armed with a few straggling spines; the endopod two-jointed, the basal joint swollen into a large ventral knob armed with spines and similar to the one in *Salmincola edwardsii* (p. 610); the terminal joint narrow and palplike and tipped with a single fleshy point on the margin next to the exopod. There is also a knob on the outer surface of the basal joint, close to the base of the endopod which projects strongly and is armed with curved spines. Mandible stout, broadened toward the base and curved, armed with four large distal teeth, which are curved and bluntly pointed, and one small, sharp proximal tooth. First maxillae short and slender, tipped with two conical spines and without a palp; second maxillae as long as, or even considerably longer than, the trunk, slender, nearly straight, and a trifle enlarged at the tips. Bulla mushroom-shaped, its diameter almost three times that of either arm, its pedicel long, large, and inflated at the distal end. Maxillipeds of medium size, the terminal joint curved and tipped with a short curved claw and an inner minute spine; the basal joint with a large papilla on its ventral surface, which is terminated by two small papillae, each bearing a spine which seems to be retractile.

Color (preserved material) a uniform yellowish-white.

Total length (excluding egg strings), 7 mm. Length of cephalothorax, 2.8 mm.; of trunk, 4.2 mm.; of second maxillae (including bulla), 8 mm.; of egg strings, 7 mm. Width of trunk, 2.8 mm.

(*siscowet*, Indian name of host).

*Male.*—Unknown.

*Remarks.*—This species was described and figured by Smith in 1874 and has not since been seen by any investigator. Fortunately, some of Smith's original specimens have been preserved in the United States National Museum, and from them the present description and figures have been taken. There is practically little to add to Smith's excellent description, but the second antennae and first maxillae are here figured, both of which present specific characters. These, with the peculiar outline of the top of the head, and the equally peculiar papilla on the maxillipeds, distinguish this species from all others.

### SALMINCOLA EDWARDSII (Olsson).

Plate 30, figs. 30 to 35.

*Lernaeopoda salmonea* MAYOR, 1824, p. 24.
*Basanistes salmonea* MILNE EDWARDS, 1840, p. 509, pl. 41, fig. 3.
*Lernaeopoda edwardsii* OLSSON, 1869, p. 36.—WRIGHT, 1882, p. 246, pl. 1, figs. 1-11.
*Lernaeopoda fontinalis* SMITH, 1874, p. 663, pl. 3, figs. 12-14.

*Host and record of specimens.*—Twenty-five adult females were obtained from the gills of brook trout, *Salvelinus fontinalis*, at the State hatchery at Wild Rose, Wisconsin, and have received the number 43574, U.S.N.M. A second lot of ten females were taken from the gills of the same host at Caledonia, New York, and are numbered 39587, U.S.N.M. Three females were taken from brook trout at Sleepy Creek, Houghton, Michigan, Aug. 30, 1905, by T. T. Hankinary, and are numbered 43577, U.S.N.M. There are two females probably belonging to this species, which are labeled "Lake Superior. U. S. Lake Survey. S. I. Smith, 1871," but the specimens are so shriveled in the alcohol as to make the identification uncertain.

Smith also described as a new species (*Lernaeopoda fontinalis*) specimens found upon brook trout at Norway, Maine, in A. B. Crockett's hatchery, which are undoubtedly the same as the present species.

Gurley in his manuscript reports a number of specimens from brook trout in the ponds of the U. S. Fish Commission Station, Northville, Michigan, which he collected April 26, 1894, during a severe epidemic which killed many of the fish. Specimens were also sent to the United States National Museum May 16, 1911, from trout in a small brook at South St. Paul, Minnesota, by Marshall E. Humphrey, of the Kinnickinic Fisherman's Association. These were identified by the present author and returned to Mr. Humphrey.

*Specific characters of female.*—Cephalothorax inclined at an angle of about 45° to the trunk axis, elongate-triangulate, broadest across the posterior margin, narrowing to a rounded point anteriorly, two-thirds as long as the trunk, and separated from it by a well-defined groove and by the ridge formed by the bases of the second maxillae. Trunk pear-shaped, narrowed anteriorly where it joins the cephalothorax, but without a definite neck; flattened on the ventral surface, strongly convex dorsally; no anal laminae or posterior processes, but in all the younger and in some of the adult specimens there is a small genital process. Egg strings short and stout, rarely longer than the trunk; eggs of good size, arranged in 4 or 5 longitudinal rows, from 12 to 15 eggs in each row. First antennae short, nearly the same diameter throughout, tipped with two or three minute spines and showing no traces of segmentation. Second antennae biramose, the exopod rounded and unsegmented, covered on the outer, and a part of the terminal, margin with short spines curved inward; the endopod two-jointed, the basal joint swollen on its ventral and lateral margins into a rounded knob covered with short curved spines, the terminal joint much narrower than the basal, palp-like, and terminating in two fleshy points. Mandibles relatively short and stout, the distal third armed with 5 or 6 curved teeth without any secondary teeth. First maxillae short and rather stout, terminating in one (Wright) or two curved spines, the palp flask-shaped, shorter than the maxilla, and terminating in one or two (Wright) curved spines. Second maxillae (excluding the bulla) about the same length as the fused trunk, the same diameter throughout, and extending around the back of the head to form a thick collar or ridge. Bulla mushroom-shaped, one-third as long and nearly twice the diameter of the maxillae, with a conical pedicel. None of these specimens showed the bilateral character spoken of by Wright (1882, p. 248). Maxillipeds three-jointed, the two basal joints considerably swollen, the terminal joints tapering strongly, the claw minute and curved.

Color (preserved material) a uniform grayish-white.

Total length (without egg strings), 4.35 mm. Length of trunk, 2.5 mm.; of arms and bulla, 2.85 mm.; of egg strings, 2.5 to 4.5 mm.

(*edwardsii*, to Milne Edwards).

*Specific characters of male.*—Since this is the only male known in the genus the specific characters are the same as the generic (p. 603).

*Remarks.*—This species was first described by Mayor in 1824 under the name *Lernaeopoda salmonea*, because he believed it to be the same as the species which Gissler, Linnaeus, and Blainville had published under that name. Milne Edwards in 1840 assigned Mayor's species to the genus *Basanistes*, while he retained Gissler's species in the genus *Lernaeopoda*. In 1869 Olsson changed the species back again to the genus *Lernaeopoda*, but confirmed Milne Edwards's opinion that it was not the same as the *salmonea* of Linnaeus. Accordingly, he proposed the new name *edwardsii* for it, and it has been thus known ever since. From the descriptions and figures of these various authors there seems to be no reasonable doubt that the form found in Europe is identical with that on the American trout. Attention is called especially to the form of the bulla, the hump joining the bases of the arms, the second antennae, and the maxillipeds as the distinguishing characters of the species.

### SALMINCOLA OQUASSA, new species.

Plate 31, figs. 36 to 40.

*Host and record of specimens.*—Five females with egg strings were obtained from blue-back trout, *Salvelinus oquassa*, at Rangeley Lakes, Maine, Nov. 27, 1884, by Prof. L. A. Lee, of Bowdoin College. They are numbered 39604, U.S.N.M. One of them has been selected to serve as the type of the new species and is numbered 43578, U.S.N.M. They were attached to the inside of the operculum of the trout.

*Specific characters of female.*—Cephalothorax narrow and much longer than wide, forming with the trunk a crescent or semicircle.

Trunk pear-shaped, strongly narrowed anteriorly but without a definite neck; squarely truncated posteriorly. Egg strings considerably shorter than the trunk and rather plump, slightly curved and attached to the body not by their ends but on one side near the end, so that they project both forward and backward eggs large, arranged in 5 rows, about 10 in each row.

First antenae minute, only two joints visible, the terminal one armed with a single small spine. Second pair large and stout, the basal portion definitely two-jointed; the endopod well rounded, one-jointed and armed with numerous short and sharp spines; the exopod two-jointed and tipped with two larger and blunter spines. First maxillae quite small, set well up on the mouth-tube, and tipped with two short and stout spines. Second maxillae stout, quite straight, and joined at the tip to a conical bulla whose length and diameter are about equal to that of the arms themselves. Maxillipeds reaching the extreme tip of the mouth-tube, rather slender, ending in a curved claw with a tiny spine at its base; the second joint also carries on its ventral surface a short process armed with a blunt spine.

*Male.*—Unknown.

Color (preserved material) a uniform brownish-white.

Total length (without egg strings), 4.25 mm. Length of trunk, 2.5 mm; of arms, 3 mm.; of egg strings, 2 mm. Width of trunk, 1.75 mm.; of egg strings, 0.66 mm.

(*oquassa,* the specific name of the host.)

*Remarks.*—The above specimens were found in a collection sent to the Museum by Professor Lee. They are somewhat shrunken, but show unmistakably that they do not belong to any known species and accordingly are used as the types of a new species.

They are most closely related to *alpina* and *edwardsii,* from which they can readily be distinguished by the much greater length of the maxillipeds and by the details of the second antennae.

### SALMINCOLA BICAULICULATA (Wilson).

Plate 31, figs. 41 and 42.

*Lernaeopoda bicauliculata* WILSON, 1908, p. 472, pl. 82.

*Host and record of specimens.*—Three females were taken from the tips of the gill filaments of the Dolly Varden trout, *Salvelinus malma,* at Bering Island by Gov. N. Grebnitzky. These were made the types of the species and were numbered 38594, U.S.N.M.

Two females were obtained by Dr. L. Stejneger at Bering Island in 1882, from an unknown host. These are Cat. No. 8453, U.S.N.M. A single female was taken from a "trout" at Mapleton, Oregon, by Dr. S. E. Meek in 1896, and is Cat. No. 38575, U.S.N.M.

*Remarks.*—This species was fully described and figured in 1908. It may be recognized by the two pedicels of the bulla, by the wide separation of the bases of the egg strings, by the peculiar pattern of the dorsal surface of the head, and by its attachment to the tips of the gill filaments. Two figures, one of them new, are introduced here for comparison.

### SALMINCOLA FALCULATA (Wilson).

Plate 31, figs. 43 and 44.

*Lernaeopoda falculata* Wilson, 1908, p. 473, pl. 83.

*Host and record of specimens.*—Four females from the gills of the blue-back salmon, *Onchorhynchus nerka,* at Baker Lake, Washington, in 1902, by the United States Bureau of Fisheries, Cat. No. 38586, U.S.N.M. One female from Bristol Bay, Alaska, no date or host, Cat. No. 8340, U.S.N.M. Three lots obtained by the United States Bureau of Fisheries from trout in California, Cat. Nos. 38588, 38589, and 38590, U.S.N.M.

*Remarks.*—This species may be recognized by the abruptly narrowed ends of the second maxillae, by the position and length of the egg strings, and by the contour of the dorsal surface of the head. The species was fully described and figured in 1908, but two figures, one of them new, are here introduced for comparison.

### SALMINCOLA THYMALLI (Kessler).

Plate 32, figs. 45 and 46.

*Lernaeopoda thymalli* Kessler, 1868, p. 97, pl. 4, fig. 3 *a* and *b.*—Gadd, 1904, p. 34.
*Lernaeopoda clavigera* Olsson, 1872, p. 63, pl. 5, figs. 1–6.

*Host and record of specimens.*—A single female with egg strings from the gills of *Thymallus vulgaris* at Yamtl, Sweden; three females without egg strings from *Salmo alpinus* at the same locality. Both lots were obtained by exchange with the University of Stockholm; the former is Cat. No. 20001, and the latter 19999, U.S.N.M.

*Specific characters of female.*—Cephalothorax egg or pear-shaped, almost twice as long as wide, two-fifths as long as the trunk, and bent at right angles to the axis of the latter, from which it is separated by a deep groove and by the thickened bases of the second maxillae. Trunk considerably thicker than the cephalothorax, somewhat flattened dorso-ventrally, with no traces of segmentation. A short conical genital process on the posterior end of the trunk, a little nearer the ventral surface; no abdomen, anal laminae, or posterior processes. Egg strings cylindrical, two-fifths as wide as, and a little longer than, the trunk; eggs small, arranged in 8 or 10 longitudinal rows, about 20 eggs in each row.

First antennae indistinctly four-jointed; second pair biramose, the endopod narrower and longer than the exopod and two-jointed, both rami covered with small spines. First maxillae small and tipped with three setae; second maxillae stout, curved forwards and inwards, their base at right angles to the body axis, and their tips considerably enlarged. Bulla as long as the second maxillae, club-shaped, sometimes lanceolate, and three or four times as long as wide. It is always buried in the tip of the gill filament and shows in its center an elongate transparent area. Maxillipeds concealed between the second maxillae, short and stout, with a curved terminal claw, having near its base several small spines.

Color (preserved material) a uniform grayish-yellow, the contents of the digestive tube a shining black.

Total length (without egg strings), 4 mm. Length of second maxillae, 1.6 mm.; of trunk, 2.8 mm.; of bulla, 1.5 mm. Thickness of trunk, 1.75 mm.

(*thymalli*, the generic name of the most common host.)

*Male.*—Unknown.

*Remarks.*—This species was first described by Kessler in 1868. Olsson in 1872, not knowing of Kessler's description, called it *Lernaeopoda clavigera*. Gadd in 1904, recognizing the identity of the two species, adopted Kessler's name and made Olsson's a synonym. It may be readily distinguished from all other species by its enormous club-shaped bulla. The three females taken from *Salmo alpinus* were labelled by the University of Stockholm "*Lernaeopoda alpina*," but they show none of the characters of that species while they do conform in every particular to the present species. The short and very plump body and the contour of the dorsal surface of the head are also distinguishing characters.

### SALMINCOLA INERMIS (Wilson).

Plate 32, figs. 47 to 51.

*Lernaeopoda inermis* WILSON, 1911, p. 632, pl. 68, figs. 33-36.

*Host and record of specimens.*—Found abundantly on the Lake herring, *Argyrosomus artedi*, in Lake Huron and Lake Superior.

The United States National Museum contains five lots of specimens: a single type female, Cat. No. 42283, U.S.N.M., from Knife River, Duluth, Minnesota; a paratype female, Cat. No. 42284, U.S.N.M., from Blind River, Lake Huron; a paratype female, Cat. No. 42285, U.S.N.M., from Marquette, Lake Superior; 140 females, Cat. No. 42278, U.S.N.M., from Saginaw Bay, Lake Huron; a single female, Cat. No. 6113, U S.N.M., from the gills of the humpback whitefish, *Coregonus nelsonii*, taken in the Yukon River, Alaska, by E. W. Nelson.

*Remarks.*—When this species was first described in 1911 it was placed with its nearest relatives in the genus *Lernaeopoda*.

Now that these relatives are to constitute a separate genus this species must be kept with them. It has already been fully described and figured, but attention may be called to one or two characters which appear in the large lot from Lake Huron, obtained after the previous description had been published.

The second maxillae are usually turned back against the ventral surface of the trunk, bringing the bulla close to the posterior end of the body. Young females and adults, whose ovaries are full of eggs, have a plump trunk, which is not very strongly curved and whose surface is smooth. But adults in which the eggs have been extruded into the egg strings, have a strongly curved body, with deep grooves or wrinkles. Indeed in many of these adults the cephalothorax is folded forward against the ventral surface of the trunk, the two almost touching. In these individuals there is a large longitudinal groove on either side of the body above the oviducts, and several transverse grooves, which indicate the body segmentation. The "shoulders" also project strongly in most of the specimens, making a ridge across the back of the neck. The comparative shape of the dorsal surface of the head is shown in figure 48, while the first and second antennae and the first maxillae are also presented for comparison. The species may be most readily recognized by the comparatively enormous size of the bulla, by the absence of claws on the maxillipeds, and by the turning forward of the egg strings against the walls of the trunk. From Gadd's species *extumescens,* which it most resembles, it may be told by the greater diameter of the bulla, by the larger size and prominence of the maxillipeds, by the details of the second antennae and first maxillae, and especially by the curvature of the mandibles in *extumescens,* and the wide gap in their dentition.

### SALMINCOLA BEANI (Wilson).

Plate 32, figs. 52 and 53.

*Lernaeopoda beani* WILSON, 1908, p. 470, pl. 81.

*Host and record of specimens.*—Twenty-five females from the gills of the Quinnat salmon, *Oncorhynchus tschawytscha,* McCloud River, California, Cat. No. 29068, U.S.N.M., types of the species.

Two lots obtained by the United States Bureau of Fisheries at Battle Creek, Colorado, from the same host, Cat. Nos. 38584 and 38585, U.S.N.M.

One lot obtained by Dr. C. H. Gilbert from the rainbow trout, *Salmo iridens,* at Sisson, California, Cat. No. 38605, U.S.N.M.

*Remarks.*—This species may be distinguished by the comparative length of the second maxillae, by the size and shape of the bulla, and by the distance between the maxillipeds and the other mouthparts. The contour of the dorsal surface of the head and a side view of the body are here introduced for comparison.

### SALMINCOLA GIBBER (Wilson).

Plate 33, figs. 61 and 62.

*Lernaeopoda gibber* WILSON, 1908, p. 469, pl. 80.

*Host and record of specimens.*—Fifty females from the gill arches of the Dolly Varden trout, *Salvelinus malma,* at Attu, Alaska, June

9, 1906, by the Bureau of Fisheries steamer *Albatross;* Cat. No. 38583, U.S.N.M.

*Remarks.*—This species is the most decidedly humpbacked in the genus, and may usually be recognized by this feature. The strong mushroom shape of the bulla and the details of the second antennae are also characteristic.

### SALMINCOLA CARPENTERI (Packard).

Plate 33, figs. 54 to 60.

*Achtheres carpenteri* PACKARD, 1874, p. 612, fig. 1; 1875, p. 587, fig. 237.

*Host and record of specimens.*—A number of females with egg strings were taken from "trout" in a tributary of the East River, Colorado, by Lieut. W. L. Carpenter, August 29, 1873. Unfortunately none of these original specimens have been preserved.

Two adult females, one with egg strings, and a young female were taken from a "salmon" 42 inches long at Battle Creek, Colorado, by Dr. Edwin Linton. They have received Cat. No. 43569, U.S.N.M., and will serve as surrogate types of the species.

*Specific characters of female.*—Cephalothorax about as long as the trunk and turned at right angles to the latter; antennal region separated as a rounded lobe, narrowed basally and widened distally. Trunk a plump ovoid, one-half longer than wide, and so squarely truncated posteriorly that the female without egg strings may be easily balanced in an erect position. On the ventral surface are faint indications of segmentation; no abdomen, anal laminae, or posterior processes, but a well-defined genital process on the young female, with the remains of spermatophores still clinging to it. In this young female the trunk was slender, cylindrical, well rounded posteriorly, and three times as long as wide. First antennae short and unsegmented; second pair biramose, the endopod and exopod about the same length, the former tipped with four minute spines, the latter with two very much stouter conical ones. Mandibles slender and curved, armed with six teeth, the four terminal ones much larger than the two basal ones, and curved. First maxillae slender, unsegmented, without a palp, and tipped with a single seta. Second maxillae large and stout and as long as the entire body; bulla of the usual mushroom shape, with a long and slender petiole.

The second maxillae are much shorter in the young female, and each is enlarged at the tips and joined to the bulla by a distinct petiole. The bases of these arms form a well-defined ridge around the back of the head, even in the young female; maxillipeds with a stout basal joint and a short, curved terminal claw.

Color (preserved material), a uniform pale white.

Total length (without egg strings), 4 mm. Length of trunk, 2 mm.; of egg strings, 3 mm. Width of trunk, 1.75 mm.; of egg strings, 0.9 mm.

(*carpenteri,* to Lieut. W. L. Carpenter.)

*Male.*—Unknown.

*Remarks.*—Gurley in his manuscript identifies the host of Packard's specimens as *Salmo mykiss.* However that may be, it is very possible that the two lots came from the same host, since the large fish in Colorado are called indifferently trout or salmon. Packard's description and figure leave no doubt of the identity of his species with the specimens collected by Doctor Linton.

Packard recognized that it was not a true *Achtheres,* for he says: "This species should perhaps be regarded as the type of a subgenus of *Achtheres,* which it resembles more nearly than *Lernaeocera.* The abdominal segments are very faintly indicated, and in the form and degree of development of the head and appendages it seems intermediate between *Achtheres* and *Cauloxenus.*"

The additional details here presented show clearly that it belongs to *Salmincola.*

## Genus ACHTHERES Nordmann.

*Generic characters of female.*—Body divided into three regions: a small cephalothorax with the antennal area differentiated dorsally; a plump thorax, more or less distinctly segmented, at least on the ventral surface, narrowed into a well-defined neck anteriorly, where often one of the segments is clearly separated; and a conical abdomen, usually unsegmented, but sometimes (*micropteri*) segmented; no posterior processes, anal laminae, or genital process.

First antennae distinctly three-jointed and tipped with three setae; second antennae biramose, turned down across the frontal margin, the endopod one-jointed, the exopod two-jointed; first maxillae with two terminal setae and without a palp; maxillipeds between the bases of the second maxillae, which are separate to the very tip, where they are joined to an ordinary bulla; egg strings short and stout, eggs large.

*Generic characters of male.*—Size medium (1 mm.); cephalothorax in line with the body axis, much smaller than the trunk and separated from it by a distinct groove; trunk spindle-shaped, clearly segmented, without an abdomen or anal laminae. First antennae three-jointed; second antennae biramose, the exopod two-jointed and tipped with a claw; first maxillae with two terminal setae and without a palp; second maxillae much longer than the maxillipeds, the two projecting strongly from the cephalothorax some distance behind the other mouth parts.

*Type*—*Achtheres percarum* Nordmann.

(*Achtheres,* ἀχθηρής burdensome, annoying).

*Remarks.*—This genus, as here constituted, includes only species which are parasitic upon fresh-water fishes. Of the eight species six are North American, and one of them, *coregoni,* is also found in Switzerland. The genus, therefore, may fairly be called an American one, and because the accounts of the American species are widely scattered, and in some instances difficult of access, it has been thought best to include here all that is known of them, together with some new figures which admit of easy comparison.

*Synonyms.—Achtheres carpenteri* Packard, 1874, p. 612, fig. 1, text, according to the characters here established can not belong to this genus at all, and is accordingly transferred to the new genus *Salmincola* (see p. 616).

*Achtheres selachiorum* Kurz, 1877, p. 385, pl. 25, fig. 1; pl. 27, figs. 38 to 40, is the only species found in salt water, and was stated by Claus to be the undeveloped young of *Lernaeopoda galei.*

Toward the close of his description of this "new species" Kurz stated that *Lernaeopoda galei* had been found upon the same host and in the same place. But, he added, "The identity of the two species does not appear possible. The great differences in form in *L. galei,* as van Beneden himself shows, may possibly be an indication of a difference in species (p. 388). That which induces me to cling to this new species is the elongate body form, the longer and narrower egg sacks, the club-shaped anal laminae, the distinct segmentation of the body, and the three-parted form of the attachment button in *L. galei,* not to mention other minor differences in the structure of the mouth parts" (p. 389).

All the differences enumerated by Kurz admit of easy explanation provided the specimens he secured were undeveloped young of *L. galei,* and this would be further indicated by the size he has given for them. On the other hand, to try and make of them a new species of *Achtheres* is impossible, because they are so large for that genus that they must be mature adults, but they possess a pair of good-sized posterior processes, they have no abdomen comparable with that in *Achtheres,* while the first maxillae are tripartite and have a palp. We are hence forced to accept Claus's statement that this species is a synonym of *L. galei.* The "*Achtheres* sp." mentioned by Wright (1892, p. 438, fig. 10, text) is probably the same as Krøyer's *A. pimelodi* (see p. 628).

### TABLE OF SPECIES.

1. Cephalothorax about as wide and as long as the trunk; bulla an enormous disk (3 mm. in diameter); maxillipeds reaching the frontal margin of head.
*corpulentus* Kellicott, 1880, p. 619.

1. Trunk once and a half to twice the length and width of the cephalothorax; bulla and maxillipeds normal size........................................ 2.

2. Abdomen much narrower than, and joined abruptly to, the trunk, inclined anteriorly and more or less distinctly segmented........................................ 3.

2. Abdomen the same width as the posterior portion of the trunk and passing imperceptibly into it; in the same line as the trunk axis, and with no traces of segmentation........................................ 4.

3. Arms stout; carapace much widened anteriorly; second antennae almost touching across the frontal margin; first antennae distinctly jointed.
*micropteri* Wright, 1882, p. 620.

3. Arms slender; carapace scarcely widened anteriorly; a wide gap between the tips of the second antennae; first antennae with no traces of segmentation. *lacae* Krøyer, 1863, p. 622.
4. Genital segment with a jointed process on either side, on the ventral surface at the posterior margin........................................*sandrae* Gadd, 1901.
4. No jointed processes; abdomen transversely lunate or hemispherical; maxillipeds projecting beyond anterior margin and not concealed by second maxillae. *coregoni* (Smith), 1874, p. 623.
4. No jointed processes; abdomen conical and pointed; maxillipeds small and their bases completely hidden between the second maxillae...................... 5.
5. Carapace ovate, much narrowed and well rounded posteriorly; mouth-tube projecting considerably......................*amblopltis* Kellicott, 1880, p. 626.
5. Carapace trapezoidal, twice as long as wide, almost covering the second antennae; mouth-tube not visible dorsally.................*pimelodi* Krøyer, 1863, p. 628.
5. Carapace trapezoidal, about the same length and width; not covering the second antennae; mouth-tube not visible dorsally....*percarum* Nordmann, 1832, p. 629.

### ACHTHERES CORPULENTUS Kellicott.

Plate 34, fig. 63.

*Achtheres corpulentus* KELLICOTT, 1880, p. 54, pl. 1, figs. 1 to 3.

*Host and record of specimens.*—Kellicott's specimens were taken from the gills and gill cavity of the lake herring, *Leucichthys artedi*, in Buffalo Harbor and Niagara River. The species has also been obtained as follows: In the gill cavity of the bloater whitefish, *Leucichthys prognathus*, from Lake Ontario, at Wilson, New York, by R. R. Wright. On the gills of lake herring from Lake Erie, at Dunkirk, New York, July 7, 1894, collected and identified by Cloud Rutter. On gills of lake herring from Lake Michigan, off Milwaukee, and on gills of ki-eye, *Leucichthys hoyi*, at the same locality, collected by C. H. Stevenson and identified by G. G. Gurley. From gills of bloater whitefish, Whitefish Bay, Lake Michigan, July, 1894, by R. Rathbun. From bloater whitefish, Lake Ontario, at Wilson, New York, August 26, 1894, by G. G. Gurley. From gills of whitefish, *Coregonus clupeiformis*, Lake Erie, at Dunkirk, New York, July 8, 1894, collected by Cloud Rutter and identified by G. G. Gurley.

*Specific characters of female.*—Head nearly as long and as wide as the body, ovate, with the anterior end very pointed and the posterior end broadly rounded; body in dorsal view broadly elliptical, nearly as wide as long, in lateral view hemispherical, with the tip drawn well under, as in the abdomen of certain female spiders. First antennae apparently two-jointed, the terminal joint short and tipped with four tiny setae; second antennae stout and fleshy, reaching to the anterior margin of the head; mandible with seven teeth, the second tooth the longest, the succeeding ones diminishing regularly in size; second maxillae longer than the body, tapering considerably and much wrinkled; bulla a broad and flat disk. Egg sacks broad at the base, tapering toward the apex, a little longer than the body and turned upwards and backwards against the dorsal surface of the trunk; eggs in eight rows at the base and four at the apex, about 100 eggs in each sack.

Total length (egg strings excluded), 7 mm. Length of cephalothorax, 3.4 mm.; of trunk, 3.6 mm.; of egg strings, 4.25 mm. Width of cephalothorax, 3.15 mm.; of trunk, 3.25 mm.; of bulla, 3 mm.

Color a pale grayish-white; the bulla and pedicel brown.

*Male.*—Unknown.

*First copepodid larva.*—Cephalothorax narrower and more elongated than in *amblopltis*, bluntly rounded anteriorly and irregularly truncated posteriorly. Notches between the head and first thorax segment at about the center of each lateral margin; second thorax segment half the width of the cephalothorax, with a concave posterior margin; third segment half the width of the second, and carrying near its posterior margin on either side a single spine; fourth segment the narrowest; anal laminae relatively large, each tipped with two long and two or three small and much shorter setae; first antennae turned back along the margin of the cephalothorax. Total length, 0.92 mm. Cephalothorax, 0.7 mm. long, 0.32 mm. wide.

(*corpulentus*, stout, corpulent).

*Remarks.*—This species was first collected and described by Kellicott in 1880 and was called by him the gill herring-sucker.

Many specimens were obtained from different species of whitefish in Lake Erie, Lake Michigan, and Lake Ontario during the summer of 1894. These were identified by Prof. R. R. Wright, Mr. G. G. Gurley, and Dr. Richard Rathbun. Unfortunately none of the specimens appear in the collection of the United States National Museum, but the species is so common that a good supply of typical specimens of both sexes could easily be obtained. This species may be recognized by the corpulent appearance of both the head and the trunk, which are approximately the same length and width, by the large maxillipeds which reach beyond the frontal margin of the head, and by the very broad and disk-like bulla.

### ACHTHERES MICROPTERI Wright.

Plate 34, figs. 64 to 67; plate 35, figs. 68 and 69.

*Achtheres micropteri* WRIGHT, 1882, p. 249, pl. 2, figs. 1–11.

*Host and record of specimens.*—Five females from the gills of the small-mouthed black bass, *Micropterus dolomieu*, at Burton's Landing, Kankakee River, Indiana, August 19, 1909, No. 39618, U.S.N.M. Five females from gills of large-mouthed black bass, *M. salmoides*, at English Lake, Kankakee River, August 9, 1909, No. 39544, U.S.N.M. Three females from same host at Lake Maxinkuckee, Indiana, July 29, 1906, No. 39552, U.S.N.M. Fifteen males and females from the same host at Constantia, New York, April 26, 1911, presented by Dr. Tarleton H. Bean, State Fish Commissioner of New York, No. 43566, U.S.N.M. The species was reported by Wright in the paper above cited as "found in considerable numbers, both male and female, in the mouth cavity and on the gill arches of the small-mouthed black bass, *Micropterus salmoides* (Lac.) Gill," in the vicinity of Toronto, Canada.

*Specific characters of female.*—Head considerably smaller than the trunk, the difference being about the same as in *amblopliti*s and much greater than in *corpulentus;* dorsal carapace projecting but little at the frontal margin, relatively wider anteriorly and narrower posteriorly than in *ambloplitis;* trunk broadly ovate, narrowed into a neck where it joins the cephalothorax and broadly rounded posteriorly; abdomen relatively larger than in *ambloplitis*, wider at the base where it sends out a rounded lobe on either side on the dorsal surface, and more distinctly segmented; egg strings the same width as the abdomen, shorter than the trunk, and tapering toward their tips; eggs rather small, in 3 or 4 longitudinal rows, about 50 in each string.

First antennae attached some distance behind the mouth, distinctly three-jointed, the basal joint considerably the longest and stoutest, the terminal joint armed with three good-sized setae.

Dorsal ramus (endopod) of second antenna tipped with a row of toothed and sickle-shaped spines; exopod distinctly jointed and ending in a small claw. Mandible eight- or nine-toothed, the first tooth bluntly rounded, the third tooth rudimentary and very short; inner margin of the shank sharpened to a knife-edge, widest just behind the teeth. First maxillae very broad and swollen through their center, tipped with two setae, with a third one on the inner margin which is curved strongly backward.

Maxillipeds with a medium basal joint, armed near the center of the inner margin with a raised papilla covered with small spines; the terminal claw is only slightly curved and carries on its inner margin an accessory claw, behind which is a more or less prominent serrated ridge. Second maxillae closely resembling those of *ambloplitis* in length, diameter, and wrinkling; bulla saucer-shaped and not fully chitinized. Spermatophores minute and spherical, sometimes fastened with so much cement as to deform the abdomen.

Color a decided yellowish-white, the yellow deepening to orange through the center of the body as the eggs ripen in the convolutions of the oviducts.

Total length (excluding egg strings), 4 to 4.5 mm. Length of cephalothorax, 1.33 mm.; of trunk, 2.66 mm.; of egg strings, 2.25 mm. Width of cephalothorax, 1 mm.; of trunk, 2 mm.

*Specific characters of male.*—Relatively much larger than in *ambloplitis*, but having almost exactly the same shape and proportions.

First antennae slender and distinctly three-jointed; endopod of second pair with tiny and simple spines in place of the large toothed ones of the female; exopod indistinctly jointed, with a minute terminal claw; mandibles and first maxillae like those of the female; second maxillae not as long as in *amblopiitis*, less than twice as long as the maxillipeds, each tipped with a chela composed of two claws of about the same size, the tip of the anterior one shutting into a hollow in the posterior one; maxillipeds with very stout basal joints, furnished with powerful adductor and flexor muscles; on the inner side of the basal joint is a raised papilla armed as in the female.

Color, an almost snow white.

Total length, 1.5 mm. Greatest diameter of trunk, 0.34 mm.

(*micropteri*, the generic name of the host).

*Remarks.*—This species is fairly common on both the small- and large-mouthed black bass. The female may be distinguished from *amblopiitis* by the large abdomen, with its basal lobes and distinct segmentation, and by the much smaller egg strings. This distinction may then be confirmed by the presence of large toothed spines on the second antennae in *micropteri*, and their absence in *amblopiitis* and by the first maxillae which are three parted in *micropteri*, but only bipartite in *amblopiitis*. The male may be distinguished by its much larger size and by the chelae on the tips of the second maxillae.

### ACHTHERES LACAE Krøyer.

Plate 35, figs. 70 to 74.

*Achtheres lacae* Krøyer, 1863, p. 274, pl. 17, fig. 6.

*Host and record of specimens.*—Krøyer found in the Vienna Museum two females with egg strings, which had been labelled *Achtheres lacae* by Kollar, and were said to have been taken from the mouth of a North American perch, called by Krøyer "*Perca laca.*"

Eight females with egg strings were obtained from the gills of the striped bass, *Roccus lineatus*, October 8, 1886, in the Potomac River. They are numbered 12031, U.S.N.M. One has been chosen as a surrogate type of the species and has received the number 43567, U.S.N.M.

*Specific characters of female.*—Cephalothorax ovoid, shorter than the trunk but considerably longer than wide; dorsal antennal area narrow, concave along the lateral margins and not continuous posteriorly. Trunk spindle-shaped or ovoid, segmentation very obscure, surface smooth and evenly rounded; abdomen in line with the thorax, small, conical, and distinctly segmented, and wholly in front of, or ventral to, the egg strings. It is one-third as wide and one-quarter as long as the trunk and shows up prominently from every point of view. Egg strings ellipsoidal, shorter than the trunk and about the same diameter as the abdomen; eggs fairly large, arranged in 6 or 7 longitudinal rows, about 15 eggs in a row. First antennae very short, not even reaching the end of the mouth-tube, with no signs of segmentation and with two minute terminal spines. Second antennae short and plump, not turned across the frontal margin, but inclined inward, the exopod considerably smaller than the endopod, two-jointed, and tipped with a pair of curved spines; the endopod one-jointed and with three or four small processes rather than spines toward the tip.

First maxillae short and plump, tipped with three setae of unequal size and without a palp; second maxillae slender, about the same length as the trunk, and united to a small and button-shaped bulla. These maxillae are fastened to the sides of the head much farther forward than in any other species, their anterior margins actually reaching the base of the second antennae.

Maxillipeds with a stout basal joint and a short and curved terminal claw; the basal joint has a small projection on its inner surface, and on the inner margin of the terminal claw is a comblike process, somewhat similar to that in *pimelodi*.

Color (preserved material), a uniform yellowish-white.

Total length (without egg strings), 4 mm. Length of cephalothorax, 1.75 mm.; of second maxillae, 3 mm.; of egg strings, 2 mm. Width of cephalothorax, 1 mm.; of egg strings, 0.55 mm.

(*lacae*, from Krøyer's specific name for the host).

*Male.*—Unknown.

*Remarks.*—Krøyer gives us very few details with reference to the appendages of this species, and he regarded the description which he gave as entirely provisional. On the other hand, he was entirely satisfied that the species was a valid one, and with the additional details here given we may regard this as established. The species agrees so closely with *pimelodi* and *percarum* that diagnostic separation seems at first difficult, but the present species may be recognized by the great size of the abdomen and by the fact that the second maxillae are attached so far forward on the sides of the head. It is also significant that the abdomen, although so large, shows no traces of segmentation

The species is evidently a rare one, and it would be particularly interesting to ascertain whether it infests this host when in the salt water.

### ACHTHERES COREGONI (S. I. Smith).

Plate 36, figs. 75 to 80.

*Lernaeopoda coregoni* Smith, 1874, p. 664, pl. 3, fig. 17.—Kellicott, 1880, p. 55, pl. 2, figs. 4 and 5.

*Host and record of specimens.*—Smith's original description was made from specimens found by J. W. Milner on the whitefish, *Coregonus clupeiformis* (*C. albus* Smith), at Ecorse, Michigan, and at Outer

Island in Lake Superior. Fortunately some of these specimens have been preserved and are now in the Museum collection. They are labeled by Smith himself as "Cotypes" and are numbered 39575, U.S.N.M. There is also a single specimen, a female without egg strings, taken from *Coregonus clupeiformis* at Sand Island, Lake Superior, by Milner at the same time as Smith's original types.

This may, therefore, be fairly regarded as another paratype of the species. It is numbered 38563, U.S.N.M. Kellicott reported the species as "found during the greater part of the year on the lake herring, *Argyrosomus artedi*, taken by fishermen along the Niagara River. It prefers the fins, though taken from various parts of the body." Two specimens were also taken from the kieye or chub of Lake Michigan, *Argyrosomus hoyi*, off Kenosha, Wisconsin, November 6, 1894, by C. H. Stevenson. They were identified by Gurley and are reported in his manuscript.

*Specific characters of female.*—The largest species of the genus with a total length, including arms and egg strings, of 17 mm. Cephalothorax in line with the trunk, broadly rounded posteriorly, strongly narrowed and elongate anteriorly, the lateral margins straight or even slightly concave. Trunk pear-shaped, narrowed to a neck where it joins the cephalothorax, obliquely truncated posteriorly, leaving a small conical projection at the center, which represents the abdomen. Trunk indistinctly segmented, showing transverse grooves and lateral indentations. Egg strings cylindrical, relatively long and narrow, straight or slightly curved toward each other at the center. Kellicott says, "In some cases I have found them to terminate in an apparent straight, sharp spine, a fifth or more as long as they." Eggs small, arranged in 4 or 5 longitudinal rows, from 100 to 125 eggs in each sack. First antennae stout, three-jointed, reaching well beyond the tip of the mouth tube, and terminated by three small setae. Second antennae with a stout basal portion and a small endopod (dorsal), which is swollen and armed with stout spines and short bristly hairs. The exopod (ventral) is indistinctly segmented and terminated by three larger curved spines, turned outward, and many smaller ones between them. Mandibles with four stout distal teeth, a smaller terminal one, and two or three small proximal ones; first maxillae small and two pointed; second maxillae long and slender, tapering regularly from the base to the tip; bulla ovoid and supported on so short a pedicel as to appear sessile; maxillipeds stout, reaching nearly to the tip of the mouth tube, terminal joint cylindrical and fleshy, the same diameter throughout and terminated by a tiny spine, the other two joints moderately swollen.

Total length (excluding egg strings), 8 mm. Length of cephalothorax, 2.5 mm.; of trunk, 5.5 mm.; of egg strings, 6 mm. Greatest width of trunk, 2.5 mm.

Color (preserved material), a uniform grayish-white.

*Specific characters of male.*—A single male was found by Kellicott "attached to the extremity of the female's abdomen, and so firmly that he could not be removed without mutilation." Consequently, no description was given of its general appearance or appendages, and as no other specimen has ever been obtained, it may be said that the male is unknown at the present time

(*coregoni*, the generic name of its chief host.)

*Remarks.*—This is undoubtedly a valid species, but there has been in the past some trouble in deciding whether the forms described by Smith and Kellicott were identical, and recently whether the *Achtheres coregoni*[1] of Baumann was really a new species or the same as that of Smith and Kellicott. Smith figures and describes the mandibles and maxillipeds, while Kellicott considered only the remaining appendages. Fortunately Smith's cotypes are available and we find that they correspond as fully with the figures and description given by Kellicott as they do with those published by Smith himself, and there can be no further doubt of the identity of these two forms. We find also that Baumann's species corresponds in all essential particulars and differs only in minor details. In fact there is no greater difference than would naturally be expected in specimens from such widely separated localities. However, the present author sent one of Smith's specimens to Doctor Baumann for comparison, and he says of it:

> Die fragliche *Achtheres*-Art hat nun allerdings den gleichen Aufenthaltsort und eine entfernte Aehnlichkeit mit der von mir beschriebenen, Zeigt aber im Bau der Mundgliedmassen Abweichungen auf die einzutreten mich zu weit fuhren wurde, die es mir aber un moglich machen, die beiden Arten zu vereinigen (p. 178).

If the two species are the same the identity of the names does no harm, but if they are distinct Smith's name will take precedence and Baumann must give his species a new name.

The species may be readily recognized by the contour of the dorsal surface of the head, by the enormous maxillipeds, each of which is nearly as large as the head, and by the narrow waist behind the base of the second maxillae. The ridges on either side of the external openings of the oviducts are also peculiar, as may be seen in figure 80, and they show up prominently in preserved specimens.

Relative to the transference of this species to the present genus, we may quote Smith's remark at the close of his description: "This species is probably not a true *Lernaeopoda*, and is perhaps the representative of an undescribed genus" (p. 665).

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[1] Revue Suisse de Zoologie, vol. 21, No. 5, pp. 160-171, pl. 5, figs. 8-12.

### ACHTHERES AMBLOPLITIS Kellicott.

Plate 25, fig. A; plate 36, figs. 81 to 85; plate 37, figs. 86 to 91.

*Achtheres ambloplitis* KELLICOTT, 1880, p. 56, pl. 3, figs. 6 and 7.

*Host and record of specimens.*—Three lots of this parasite were obtained from the gills of the red-eye, *Ambloplites rupestris*, at Lake Maxinkuckee, Indiana, and are numbered respectively 39614, 39615, and 43570, U.S.N.M. The first lot includes 5 females with egg strings, the second lot 15 females, and the third lot 100 specimens of both sexes. Since Kellicott's types have been lost, this last lot will serve as surrogate types of the species. Fifteen females were taken from the gills of "Redfish" at Big Payette Lake, Lardo, Idaho, and are numbered 39624, U.S.N.M. Gurley records the species as occurring on fully 50 of the red-eyes taken in the Shiawassee River, Michigan, a tributary of Lake Huron.

*Specific characters of female.*—Cephalothorax much smaller than the trunk, the separating groove being narrow and deep; ovate in outline, with a fairly well defined carapace. This carapace is wide and roundly truncated anteriorly, while the cephalothorax itself is just the reverse. It follows that where the two intersect on the lateral margins there is a shallow notch.

Trunk broadly ovate or somewhat spindle-shaped, narrowed to a short but distinct neck where it joins the cephalothorax, and tapering posteriorly to a bluntly rounded point, the abdomen.

Egg strings arising from the dorsal or dorso-lateral surface and strongly divergent, largest at the base and tapering toward the tips; eggs large, in 3 or 4 longitudinal rows, 8 or 10 eggs in each row. The genital segment between and behind the egg strings is strongly narrowed and to its posterior margin is attached the short and conical abdomen. Two spherical spermatophores, wine red in color, are often found attached to this abdomen, occupying the position usually filled by the anal laminae.

First antennae indistinctly three-jointed, long and slender, and tipped with three small setae; second antennae biramose, endopod bluntly rounded, one-jointed, and armed with tiny spines; the exopod two-jointed, narrower than the endopod, tapering quite rapidly, and armed at the tip with a single stout spine curved like a claw.

Mandible broad and stout, with six large primary teeth and a single secondary one; first maxillae consisting of a single joint, short, narrow, and bipartite at the tip; second maxillae large and stout, and in the mature adult profusely wrinkled; bulla funnel-shaped; maxillipeds with a rather stout basal joint, and a short but stout terminal claw, reenforced on the inner margin near the tip with a single spine.

The cement glands are relatively very wide, filling the whole of the dorso-lateral portions of the trunk (fig. 9). These and the remaining portions of the internal anatomy of this species have already been described under morphology (see p. 582, and following).

Color, a uniform yellowish-white, without pigment except in the egg strings, which become orange with maturity.

Total length (excluding egg strings), 4 mm. Length of cephalothorax, 1.5 mm.; of trunk, 2.5 mm.; of egg strings, 2 mm.; of second maxillae, 2 mm. Width of cephalothorax, 1 mm.; of trunk, 1.85 mm.

*Specific characters of male.*—Cephalothorax considerably smaller than the trunk, from which it is separated by a short waist; trunk spindle-shaped and distinctly segmented, first or basal segment the longest, the others diminishing regularly, except that the fifth segment is longer than the fourth; no anal laminae; first antennae three-jointed and tipped with two long setae; second pair biramose, the endopod curved and one-jointed, the exopod two-jointed and tipped with a claw; first maxillae relatively small, with two medium-sized setae at the tip; second maxillae slender and three times the length of the maxillipeds, the basal joint much elongated and fairly stout, the second joint short, and the terminal claw also short and slender; maxillipeds short and stout, the basal joint swollen and armed on its inner margin with a large process covered with spines, against which the short and stocky terminal claw shuts.

Color, a pale yellowish-white.

Total length, 1 mm. Greatest diameter, 0.3 mm.

The larvae and developmental stages of this species have been fully described in the ninth paper of the present series.

(*ambloplitis*, the generic name of the host.)

*Remarks.*—This species is as typically American as *A. percarum* is European, and is fully as widely distributed. Owing to the habits of its principal host, the red-eye, the specimens found on those fish are likely to be themselves parasitized, either by some of the Vorticellidae or by algae. Sometimes the body of the copepod is so completely covered that it looks as if it were clothed in fur. At other times it has, seemingly, long tufts of hair on its head or rump, or even on the second maxillae.

The species may be recognized by its small size, relatively short and spindle-shaped body, short and plump egg strings, the prominence of the second antennae, and the pattern of the dorsal surface of the head. As Kellicott observes, it lives chiefly on the inner surface of the gill arches, which in the red-eye are covered with teeth. The copepods, especially the younger and undeveloped stages, are so small and so mingled with the gill teeth as to be easily overlooked. But careful examination of the gill arches of almost any red-eye will reveal some of the parasites, and often many are found together on the same fish.

### ACHTHERES PIMELODI Krøyer.

Plate 38, figs. 92 to 95.

*Achtheres pimelodi* KRØYER, 1863, p. 272, pl. 17, fig. 5*a* and 5*b*.

*Host and record of specimens.*—A few young females with egg strings were obtained by Krøyer from the mouth of the channel catfish, *Ictalurus punctatus* (called by Krøyer *Pimelodus maculatus*), taken at Cincinnati, Ohio, in 1854. Two adult females were obtained by the author from the gill arches of the catfish, *Ameiurus nebulosis*, at Put-in-Bay, Ohio, July 7, 1908. They have received the number 39560, U.S.N.M. A single male was obtained from the inside of the operculum of the Fulton cat, *Ictalurus anguilla*, at Fairport, Iowa, in July 1914; this has been numbered 47726, U.S.N.M.

*Specific characters of female.*—General form plump and swollen; cephalothorax almost spherical, a little longer than wide and truncated anteriorly, its lateral margins slightly concave, not in line with the trunk but inclined at an obtuse angle. Trunk pyriform or spindle-shaped in the young females, and flattened dorso-ventrally, with two longitudinal furrows on the dorsal surface; distinctly segmented, the fifth segment much shorter than the others. Abdomen small, conical, inclined ventrally and made up of two segments, the terminal one much smaller than the basal.

In the mature adult the segmentation largely disappears, together with the longitudinal furrows, and the abdomen is more or less absorbed into the genital segment. No visible anal laminae, but Krøyer mentions a pair of very small, blunt, two-segmented (?) lobes at the posterior corners of the abdomen, which are apparent only under pressure. Egg strings as long as the entire animal and linear; eggs large, arranged in two or three rows, from 16 to 20 eggs in a row.

First antennae directed obliquely outward and forward, slender, pointed, and indistinctly segmented; second antennae large and plump and turned down across the frontal margin; basal portion made up of two equal segments; exopod (ventral) two-jointed and armed at the tip with a small spine; first maxillae very small and plump, each tipped with two setae; second maxillae slender, cylindrical, and nearly uniform in size for their entire length; bulla small, cup-shaped, and practically sessile; maxillipeds with a medium basal joint having a knob or swelling on the inner margin; terminal claw much shorter than the basal joint, with a sort of comb made up of three accessory spines on its inner margin.

Color, a uniform grayish-white.

Total length (excluding egg strings), 2.8 mm. Length of cephalothorax, 1 mm.; of trunk, 1.8 mm.; of egg strings, 3 mm. in the young, 2 mm. in adults. Width of cephalothorax, 0.90 mm.; of trunk, 1.4 mm.

*Specific characters of male.*—Cephalothorax relatively wider than in *amblopitis*, and not separated as distinctly from the trunk, the two in the same straight line; trunk spindle-shaped and indistinctly segmented, with a pair of small, claw-shaped anal laminae, curved dorsally; first antenna four-jointed, the second joint nearly as long as the other three, tipped with three short setae; second antenna biramose, the basal portion two-jointed, the joints at an angle with each other, the endopod (dorsal) one-jointed, short, thickset, and terminated by a single spine, the exopod (ventral) two-jointed, the terminal joint inclined dorsally and armed with a large curved claw at the upper distal corner, and three small spines along the distal margin; first maxillae slender and tipped with two stout setae jointed near their bases, palp a mere knob on the inner margin tipped with a minute papilla; second maxillae much longer than the maxillipeds, rather slender but with strong muscles and ending in stout claws; maxillipeds with a swollen basal joint carrying on its inner margin a corrugated process against which the short terminal claw shuts.

Total length 2.15 mm. Greatest diameter 0.52 mm.

Color, a uniform grayish-white.

(*pimelodi*, Krøyer's generic name for the host.)

*Remarks.*—It is evident from Krøyer's description that his specimens were young females and not fully grown adults. This may be seen in the distinct segmentation, the remnants of the anal laminae and swimming feet, which he mentions as being found on the abdomen and the first thorax segment, respectively. The adults here presented agree so completely in all their general details as to leave no doubt of their identity. The points in which they differ are just those that would be looked for in the two stages of development—a disappearance of the swimming feet, body segmentation, and anal laminae, and a fusion of the abdomen with the trunk. Hence the presence of these differences confirms rather than disparages the identity of the two.

Probably also the "*Achtheres* sp." mentioned by Wright in the Report of the Ontario Game and Fish Commission for 1892 (p. 438, fig. 10, text), is the same as the present species.

It is evidently not a very common species since the examination of hundreds of catfish by the present author yielded only the three specimens mentioned above.

### ACHTHERES PERCARUM Nordmann.

Plate 39, figs. 96 and 97.

*Achtheres percarum* Nordmann, 1832, p. 63, pl. 4, figs. 1-11; pl. 5, figs. 1-12.—Claus, 1862, p. 287, pls. 23 and 24.

*Host and record of specimens.*—The United States National Museum collection contains two lots of this species, the first containing nine females without egg strings, taken from the mouth of *Lucoperca* in the Danube River at Hesse, Germany. This lot is numbered 39576, U.S.N.M.

A second lot of two females with egg strings was taken from the gills of *Perca fluviatilis* at Yamtland, Sweden, and was obtained by exchange with the University of Stockholm. It has been numbered 43580, U.S.N.M.

*Specific characters of female.*—Cephalothorax nearly as large as the body and ovate, inclined at right angles to the trunk axis, the trunk as wide as long and distinctly segmented, obovate in outline and flattened dorso-ventrally; abdomen small, triangular and without joints; each egg string often as large as the body and ellipsoidal, containing about 75 eggs. First antennae slender, exceptionally long, and distinctly three-jointed; second pair with a simple exopod, armed with short spines and considerably curved toward the endopod; the latter also simple and tipped with a single spine; first maxillae three-partite, the three rami all on a level; second maxillae stout and tapered considerably anteriorly; bulla as wide as both arms at their tips and cup-shaped; claw on the maxillipeds smooth and rather slender.

Color, a grayish-white.

Total length (without egg strings), 4.5 mm. Length of cephalothorax, 2.2 mm.; of trunk, 2.3 mm.; of egg strings, 2.5 mm. Width of cephalothorax, 2 mm.; of trunk, 2.3 mm.; of egg strings, 1.66 mm.

(*percarum*, the generic name of the host.)

*Specific characters of male.*—Cephalothorax fully as long as the trunk, widest posteriorly, with concave lateral margins; body indistinctly segmented, a flattened sphere in shape, ending in a blunt tip posteriorly, where it is armed with two short anal laminae. First antennae very slender and three-jointed as in the female; neither ramus of the second pair armed as well as in the female; first maxillae three-partite; second maxillae long, with a wrinkled basal joint and a small chela on the tip of the terminal joint; claw of maxillipeds short and stout, shutting down against a small papilla on the inner margin of the basal joint.

Color, a creamy white.

Total length, 1.5 mm. Greatest width, 0.66 mm.

*Remarks.*—Both sexes of this species have been admirably described and figured by both Nordmann and Claus, the latter also giving the internal anatomy and several stages in the development. Hence there have been here included only the distinguishing characters and two outline figures for comparison. These plainly show that it is different from all the American species, and thus far it has never been found upon any American host, although it is widely distributed throughout Europe. Like the American species, *amblopliti*s, it is much infested with parasitic Vorticellidae and algae, and specimens are often found completely covered with these plants and animals.

### Genus LERNAEOPODA Blainville.

*Generic characters of female.*—Cephalothorax more or less inclined to the trunk axis, short, thickset, and covered with a distinct dorsal carapace; first one or two thorax segments well differentiated, the others thoroughly fused with one another and with the abdomen; no anal laminae; genital process minute; a posterior process on either side of the genital process and ventral to the egg strings. First antennae four-jointed; exopod of second antenna much smaller than the endopod and two-jointed; mandibles slender, teeth bluntly rounded or even truncated; first maxillae tipped with three setae, sometimes jointed; palp present, with three terminal setae; tips of the second maxillae enlarged into disks or furnished with a bulla; egg strings long and slender.

*Generic characters of male.*—Size unusually large (2 to 3.5 mm.); cephalothorax more or less inclined to the trunk axis, separated from the trunk by a well-defined groove and covered with a dorsal carapace; trunk of young males conical and segmented, later becoming inflated and losing its segmentation; anal laminae often exceptionally large and turned forward dorsally. First antennae four-jointed; second antennae chelate; second maxillae with a large spinous process on the basal joint, forming a chela with the terminal claw; maxillipeds much larger and stouter than the maxillae.

*Type.*—*Lernaeopoda brongniartii* Blainville.

(*Lernaeopoda*, *Λερνᾶιος*, Lernaean and *πούς*, foot).

*Remarks.*—This genus was founded by Blainville in 1822, with the type-species *L. brongniartii*, specimens of which he observed "in the collection of Brongniart, who did not know where or on what kind of a fish they had been obtained" (p. 442). He also included with the type the species *salmonea* of Gissler, of which, however, he said that he had never seen a specimen, and that possibly it did not belong to this genus. An examination of the two species quickly convinces one that they belong to different genera, as here indicated. Although Blainville's type has never been seen by any other observer, it was described and figured well enough to show its relationship to Grant's species, *elongata*, and Krøyer's species, *galei*. These two species are very well known, and have been repeatedly described and figured; taken together, therefore, they will serve as a sort of common coenotype of the genus, and will illustrate for us its chief characters.

With these three species we may retain in the original genus Thomson's *musteli*, Kane's *bidiscalis*, and Richiardi's *scyllii*, making six in all. The five of these whose hosts are known are all parasites on the genital apparatus, or the eyes of sharks.

The other species which have from time to time been referred to this genus must be transferred to the new genera, *Lernaeopodina* and *Salmincola,* or they prove to be synonyms. If the number left in the original genus seems small while those transferred to other genera is unduly large, we must remember that hitherto practically no attention has been paid to the structure of the male. Furthermore, this genus with *Clavella* (*Anchorella*), has for years served as a dumping ground for such species as could not with certainty be located anywhere else. And, finally, if we could select *salmonea* as the type of Blainville's genus we could still retain the majority of the species in the original genus. But Blainville never even saw a specimen of *salmonea,* so that we are obliged to abide by the decision, even though it does cause so many changes.

Accordingly we transfer to the new genus *Salmincola* the following species, because they have no dorsal carapace, no free thorax segment, no posterior processes, no palp on the first maxillae, while the rami of the second antennae are unsegmented. *L. alpina* Olsson, 1877, p. 82, pl. 5, figs. 10 to 13; *arcturi* Miers, 1877, p. 106, pl. 4, fig. 2; *beani* Wilson, 1908, p. 470, pl. 81; *bicauliculata* Wilson, 1908, p. 472, pl. 82; *californiensis* Dana, 1852, p. 1379, pl. 96, fig. 1, *a* and *b*; *carpionis* Krøyer, 1837, p. 268, pl. 2, fig. 6; *edwardsii* Olsson, 1869, p. 36; *extumescens* Gadd, 1901, p. 100; *falculata* Wilson, 1908, p. 473, pl. 83; *gibber* Wilson, 1908, p. 469, pl. 80; *inermis* Wilson, 1911, p. 632, pl. 68, figs. 33 to 36; *lotae* Olsson, 1877, p. 84, pl. 6, figs. 14 to 19; *maraenae* Olsson, 1877, p. 80, pl. 5, figs. 6 to 8; *salmonea* (Gissler), 1751, p. 185, pl. 6, figs. 1 to 5; *siscowet* Smith, 1874, p. 664, pl. 3, figs. 15 and 16; *thymalli* Kessler, 1868, p. 97, pl. 4, fig. 3, *a* and *b*.

*L. bicaudata* Krøyer, 1837, p. 275, pl. 3, fig. 11, is transferred to the genus *Charopinus* (see p. 656).

*L. clavigera* Olsson, 1872, p. 63, pl. 5, figs. 1 to 6, is the same species that had been described four years before by Kessler under the name *L. thymalli* (see p. 613).

*L. cluthae* T. Scott, 1900, p. 173, pl. 8, figs. 27 to 37, is shown by the form and segmentation of the male to belong to the genus *Charopinus* (see p. 654).

*L. coregoni* Smith, 1874, p. 664, pl. 3, fig.17, belongs to the genus *Achtheres,* as has already been shown on p. 623.

*L. coregonorum* and *L. extensa* were established by Kessler in a paper entitled Materials toward a Knowledge of the Onega Sea and the District about it, particularly in its Zoological Aspects. They are both described on p. 97 and figured on plate 4, figs. 1 and 2. After a careful examination of these figures and a condensed description of the same species given by Gadd in 1904 it is certain that neither of the species belongs to the genus *Lernaeopoda* as here constituted. They have no dorsal carapace, no differentiated thorax segments, no posterior processes, and no palp on the first maxillae. They do agree, however, in all known particulars with the new genus *Salmincola,* and accordingly are transferred to that genus.

*L. cyprinacea* Hermann, 1783, pl. 2, fig. 7, is a synonym of Gissler's *L. salmonea.*

*L. dalmanni* (Retzius), 1829, p. 109, pl. 6, belongs to the genus *Charopinus* (see p. 655).

*L. fontinalis* Smith, 1874, p. 663, pl. 3, figs. 12 to 14, is a synonym of Olsson's *L. edwardsii.*

*L.* (?) *lampri* T. and A. Scott, 1913, p. 202, pl. 33, fig. 6; pl. 49, figs. 12 to 16, if compared with the male shown in fig. G will be found to agree so closely as to leave no doubt that the species belongs to the genus *Thysanote* rather than to *Lernaeopoda* (see p. 650).

*L. longibrachia* Brian, 1912, p. 39, pl. 2, fig. 5; pl. 12, figs. 1 to 12, and *L. longimana* Olsson, 1869, p. 38, pl. 2, figs. 18 to 22, have no dorsal carapace and no free thorax segment, both rami of the second antennae are unsegmented, and the posterior processes are dorsal instead of ventral. For these reasons they are transferred to the new genus *Lernaeopodina* (see p. 640).

*L. musteli* Thomson, 1889, p. 373, pl. 28, figs. 9 and 9*a*, is founded on a single female, has never been seen by any other investigator, and no data are given with reference to the appendages, so that it can not be located anywhere with certainty, but is possibly a synonym of *L. galei.*

*L. obesa* Krøyer, 1837, p. 270, pl. 3, fig. 13, *a* to *c*, was shown by Olsson to belong to the genus *Brachiella* (see p. 701).

*L. scyllii* Richiardi, 1880, p. 151, was a mere name without description or figures, but Brian identified it in 1899 and gave a text figure of the female. If his identification is right, the species is a synonym of *L. galei.*

*L. sebastis* Krøyer, 1863, p. 279, pl. 17, fig. 7, *a* to *h*, is founded upon two mutilated specimens obtained from a Greenland fish and has never been seen by any other investigator. It presents several details which are radically different from the genus as here established, notably in the structure of the second antennae and first maxillae, as well as in the absence of posterior processes and a dorsal carapace. The two appendages which look like posterior processes in Krøyer's figure are stated in his description to be spermatophores. There are enough of these differences to exclude the species from the genus *Lernaeopoda,* but not enough to enable us to locate it anywhere else with even a probability. Hence the best that can be done is to leave it until further details can be obtained.

*L. similis* T. and A. Scott, 1913, p. 202, pl. 61, figs. 5 and 6, has no dorsal carapace, no free thorax segment, and the posterior processes are dorsal. These facts with other details warrant its transfer to the new genus *Lernaeopodina*.

*L. spinacis* Brian, 1912, p. 36, pl. 5, fig. 8; pl. 11, figs. 3 to 6, shows in the male a structure entirely distinct from *Lernaeopoda* and is accordingly transferred to the new genus *Lernaeopodina*.

*L. stellata* Blainville, 1823, p. 112, was figured by Milne Edwards, 1840, pl. 40, fig. 12, but has never been well enough described to be located anywhere definitely.

### TABLE OF SPECIES.

1. Ends of second maxillae enlarged into flattened disks; no bulla; posterior processes foliaceous .......... 2.
1. Ends of second maxillae united to a button-shaped bulla; posterior processes usually cylindrical, sometimes foliaceous .......... 3.
2. Second maxillae filiform; terminal disks mere flattened claws; maxillipeds with stout chelae; posterior processes turned forward ventrally. *brongniartii* Blainville, 1822, p. 634.
2. Second maxillae stout, terminal disks three times the diameter of the maxillae; maxillipeds with a simple, slender claw .......... *bidiscalis* Kane, 1892, p. 635.
3. Size small (5 mm.); neck short and indistinct; posterior processes filiform; second maxillae longer than the trunk; can not be located with certainty. *musteli* Thomson, 1889, p. 635.
3. Size medium (12 mm.); neck distinctly segmented; posterior processes stout, sometimes foliaceous; second maxillae two-thirds the length of the trunk. *galei* Krøyer, 1837, p. 635.
3. Size large (20 mm.); neck distinctly segmented; posterior processes mere knobs; second maxillae two or three times the length of the trunk. *elongata* (Grant), 1827, p. 637.

### LERNAEOPODA BRONGNIARTII Blainville.

*Lernaeopoda brongniartii* Blainville, 1822, p. 442, figs. 15 and 15*a*.

*Generic characters of female.*—Since this was Blainville's type species, and since it has been seen by no other observer, it seems best to translate Blainville's original description, explaining in parentheses the appendages and parts designated:

> Body slender, quite elongate, divided into an oval abdomen (trunk) and a cephalothorax, flattened and covered with a hard carapace; a pair of palps (first maxillae), short, stout, conical, and subarticulate, accompany the mouth; two pairs of legs (second maxillae and maxillipeds), articulated and furnished with claws, on the thorax; egg sacks short and subcylindrical. The anterior pair of legs (maxillipeds) short and formed of two joints and one claw; the posterior pair (second maxillae) much the longer, slender, cylindrical, with a terminal flattened, triangular claw. . . . .
>
> The abdomen (trunk) is oval and a little flattened. The two sacks with which it terminates behind are covered with a horny skin, somewhat transparent, which permits one to see that their interior is filled with a hepatic substance, fully resembling that in the abdomen. The long legs (second maxillae) were made up in the same way.

To this may be added that the cephalothorax is inclined to the trunk while the posterior processes, or sacks, as Blainville calls them, Furthermore, Blainville's second figure shows that the exopod of the second antennae is segmented, and that the claws on the maxillipeds are chelate.

Total length, 13 or 14 mm. Length of cephalothorax, 4 mm.; of trunk, 10 mm.; of posterior appendages, 4.5 mm. Width of trunk, 5 mm.

(*brongniartii*, to Prof. Alexandre Brongniart, of the Faculty of Science at Paris).

### LERNAEOPODA BIDISCALIS Kane.

*Lernaeopoda bidiscalis* Kane, 1892, p. 203, pls. 9 and 10.

*Remarks.*—This species was obtained by Kane from the claspers of male topes, *Galeus vulgaris*, caught off the coast of Ireland in 1890, and both sexes were admirably described and figured. The female agrees in all essential generic particulars with the one described by Blainville, and the male is taken as the type male of the genus (see pl. 25, fig. B). Attention is called to the fact that in both of these species there is no bulla, and that the posterior processes are foliaceous. In the undeveloped young of both sexes the trunk shows distinct segmentation.

### LERNAEOPODA MUSTELI Thomson.

*Lernaeopoda musteli* Thomson, 1889, p. 373, pl. 28, figs. 9 and 9*a*.
*Achtheres galei* Brian, 1906, p. 101.

*Remarks.*—This species was described by Thomson from a single specimen taken from the cloaca of the smooth hound, *Mustelus antarcticus*, near New Zealand. Neither the description nor the figures give us sufficient data for a definite location of the species. We have no details of any of the appendages or mouth parts, and the single figure (9*a*) of the under surface of the cephalothorax is so small that it gives only the relative position of the various organs. Brian in the reference given above makes this species, Richiardi's *Lernaeopoda scyllii*, and Kurz's *Achtheres selachiorum*, all synonyms of Krøyer's *Lernaeopoda galei*, but he changes the genus of Krøyer's species and calls it *Achtheres galei*. The male of *L. galei* shows conclusively that it can not be included in the genus *Achtheres*, and the absence of an abdomen and the presence of posterior processes in the females of the other species debar them from the same genus. The only thing that we can do with this species described by Thomson is to leave it where he placed it until we can get further details.

### LERNAEOPODA GALEI Krøyer.

*Lernaeopoda galei* Krøyer, 1837, p. 272, pl. 3, fig. 5, *a* to *f*.—Baird, 1850, p. 334, pl. 35, fig. 7.—T. Scott, 1900, p. 172, pl. 8, figs. 16 to 25.

*Host and record of specimens.*—In the collection of the United States National Museum there is a single female of this species, with attached males. They were taken from a smooth hound at Cornwall, England, and were obtained by exchange from Rev. A. M. Norman; they are numbered 8346, U.S.N.M.

*Specific characters of female.*—Cephalothorax comparatively very small, oval in outline, strongly flattened dorso-ventrally, and covered with a distinct dorsal carapace. Trunk slender, obclavate, narrowed where it joins the cephalothorax and with the first one or two thorax segments well differentiated; broadest and thickest at the posterior end, which is well rounded and terminates in two cylindrical processes, on a level with the ventral surface and somewhat divergent; between these processes on the median line is a small genital process; egg strings narrow and as long as the body; eggs large and somewhat flattened anteroposteriorly, arranged in 4 to 6 longitudinal rows, about 150 eggs in each string. Basal joint of first antenna much enlarged, the other three joints diminishing regularly in size. Exopod of second antennae only one-fourth the diameter of the endopod, distinctly two-jointed, and ending in several short spines. First maxillae tripartite, one ramus terminal, the other two on the inner margin, palp well developed and tipped with two short and curved spines. Second maxillae as long as the trunk, slender, cylindrical, and slightly swollen at the tip, where they are furnished with a small bulla. Maxillipeds situated between the bases of the second maxillae, with a stout basal joint armed on the inner margin with two rounded knobs covered with spines, terminal claw rather slender, with a bunch of accessory spines near its tip.

Color, a uniform grayish-white, but varying greatly in specimens from different hosts and also in different specimens from the same host. Van Beneden (1851, p. 120) obtained this species from four different genera of Plagiostoma, *Mustelus*, *Trygon*, *Galeus*, and *Scyllium*. He notes that some of the parasites had yellow bands on the heads, antennae, second maxillae and maxillipeds, in others these organs were all of a bright red color, while in still others this same red color was confined to the anterior part of the thorax. Similar colors are found in certain of the Lernaeidae whose attachment organs are buried in the tissues of the host, and both there and in the present species the color is remarkably permanent, withstanding strong alcohol for many years.

Total length, 10 to 15 mm. Length of cephalothorax, 1.5 mm.; of trunk, 9 mm.; of posterior processes, 2 mm.; of egg strings, 10 mm.

*Specific characters of male.*—Cephalothorax in line with the trunk axis, half the entire length, considerably larger than the rest of the body, and covered with a distinct dorsal carapace. Trunk cylindrical, slightly increased in diameter at the center and indistinctly segmented; toward the posterior end on the ventral surface may be seen the two genital openings for the extrusion of the spermatophores; behind these but thoroughly fused with the trunk is a small unsegmented abdomen, which carries a pair of anal laminae attached to its posterior margin on a level with the dorsal surface. These are narrowed into a slender neck where they join the abdomen, then swell suddenly into a plump, somewhat flattened cylinder which is short and pointed at the tip and is turned forward along the dorsal surface of the body.

The appendages are similar to those of the female, except that both the second maxillae and maxillipeds are chelate, the terminal claw shutting against a curved spine or process on the inner margin of the second joint.

Color, a uniform yellowish-white.

Total length, 2.15 mm. Greatest diameter, 0.65 mm.

(*galei*, from the generic name of the most common host.)

*Remarks.*—This male is one of the largest in the entire family and it seems to prefer to attach itself to the body of the female at the anterior end and just behind the cephalothorax instead of at the posterior end. Scott reports this species as found in company with *bidiscalis* upon the male tope, *Galeus canis*. The present species adhered to the skin beneath and between the ventral fins, while *bidiscalis* was found adhering to the ends of the claspers.

### LERNAEOPODA ELONGATA (Grant).

Plate 39, fig. 98.

*Lernaea elongata* GRANT, 1827, p. 147, pl. 2, fig. 5.

*Lernaeopoda elongata* KRØYER, 1837, p. 259, pl. 2, fig. 12.—BAIRD, 1850, p. 333, pl. 35, fig. 5.—T. SCOTT, 1900, p. 171, pl. 8, figs. 11 to 15.

*Host and record of specimens.*—Three fine females, two of which have attached males, are numbered 12037, U.S.N.M., but there is no record of the host or locality. Another female was obtained in Greenland by N. P. Scudder and is numbered 39574, U.S.N.M. No host is given for this specimen, but as it was obtained from the fishermen off the coast it was probably taken from a shark. All four of these females have unbroken egg strings.

*Specific characters of female.*—Cephalothorax small, ovoid, flattened dorso-ventrally, and inclined at right angles to the trunk axis. First two segments of the trunk distinctly differentiated, the others merely indicated by surface grooves; trunk cylindrical, more or less strongly flattened dorso-ventrally, two or three times as long as wide, with a row of pits or depressions along either side of the dorsal midline; the posterior end with prominent well-rounded corners, and in the center between the bases of the egg strings and on a level with the ventral surface two short knoblike posterior processes. Egg strings considerably longer than the body, slender, and cylindrical; eggs minute, arranged in 20 to 30 longitudinal rows, about 100 eggs in a row.

First antennae four-jointed, rather slender; second pair with a tiny exopod inserted on the side of the endopod, the former tipped with four spines, the latter smooth. Mandibles slender, with eight comblike teeth, all of the same size; first maxillae tipped with three jointed setae, palp long and tipped with three spines.

Second maxillae long and stout and more or less wrinkled, jointed at the tip by a button-shaped bulla. These maxillae are attached to the sides of the head, on a level with the dorsal surface, and just outside the bases of the maxillipeds. The latter have a moderately stout basal joint, carrying a short process on its inner margin, which is covered with bristling hairs; terminal claw short and slender, with an accessory spine on the inner margin near the tip.

Color (preserved material), a uniform yellowish-white, the pitted areas brownish, the egg strings orange.

Total length (without egg strings), 22 mm. Length of second maxillae, 14 mm.; of egg strings, 25 mm. Greatest width, 5 to 7 mm.

*Specific characters of male.*—Cephalothorax inclined to the trunk axis nearly at right angles and covered by a well-defined carapace; trunk conical and distinctly segmented in younger specimens, but thickening posteriorly and losing its segmentation in older specimens; in both it is about the same length as the cephalothorax and terminates in two small spinelike anal laminae, curved backward along the dorsal surface. First antennae four-jointed, slender; second pair, chelate, the endopod ending in a leaflike lamina, smooth and unarmed, the exopod with a small terminal lamina bifid nearly to its center. First maxillae tipped with two long setae and a shorter one on the inner margin; second maxillae rather stout and tipped with a stout claw; maxillipeds also stout, the terminal claw curved and fitting against a process on the basal joint, making a powerful chela.

Color (preserved material) a uniform yellowish-white.

Total length, 2.5 mm. Length of cephalothorax, 1.2 mm. Greatest width, 0.75 mm.

(*elongatus*, elongate, alluding to both the trunk and the egg strings.)

*Remarks.*—The male described by Steenstrup and Lütken differs from the two found upon the present females chiefly in the inflation and segmentation of the trunk. In their specimen the trunk was almost spherical and showed no traces of segmentation; in the present specimens it tapers decidedly backwards and is distinctly segmented. But these are just the differences one would expect between young and fully developed males.

The minute size and enormous number of the eggs is also worthy of notice. Possibly the copepodid larvae can not attach themselves to any other portion of the host's body except the eye where they are always found. If this be true, it would greatly restrict their chances of survival and so would necessitate a much larger number of eggs.

## LERNAEOPODINA, new genus.

*Generic characters of female.*—Cephalothorax at an oblique angle with the trunk, much smaller than the latter, and the two separated by a distinct groove; dorsal carapace small and poorly defined; trunk pear-shaped, much narrowed anteriorly; no anal laminae, but two small posterior processes dorsal to the egg strings; no genital process or external segmentation; first antennae three-jointed; second antennae biramose, the rami about the same size, unsegmented, and covered with bristles and spines; first maxillae bipartite, with a short palp; second maxillae slender, bulla button-shaped; maxillipeds with slender terminal claw, having an accessory claw on the inner margin; egg strings short and stout.

*Generic characters of male.*—Body bent twice at right angles, so that the trunk and the anterior portion of the cephalothorax are parallel with the second maxillae and maxillipeds; trunk separated from the cephalothorax by a well-defined groove, unsegmented, and terminating in two anal laminae, each tipped with a small spine; first antennae three-jointed; second antennae biramose but not chelate; first maxillae slender, without a palp and tipped with two setae; second maxillae and maxillipeds very large and stout, and armed with strong chelae.

*Type.*—*Lernaeopodina relata*, new species.

(*Lernaeopodina*, *Lernaeopoda* and ending denoting likeness.)

*Remarks.*—It will be noted that the species belonging to this new genus are parasitic on rays and sharks which inhabit the deeper portions of the ocean. Brian called attention to this fact in connection with the two new species which he established in 1912 (p. 38). And it may be still further emphasized by the three species taken from deep water rays, Olsson's *longimana*, T. Scott's *cluthae*, and the new species, *relata*. There must be the same adaptation to pressure in the parasites which obtains in the fishes serving as their hosts. This fact ought to have some systematic value in indicating the close relationship of these species. The simplest way to distinguish the genus from *Lernaeopoda* is by the posterior processes in the female which are dorsal to the egg strings instead of ventral. To this may be added the equal size of the rami of the second antennae, both of which are unsegmented, while the first maxillae are bipartite. The *Lernaeopodina* male is very much smaller than that of *Lernaeopoda*, and its body is bent twice at right angles, the cephalothorax has no carapace, and the second maxillae as well as the maxillipeds are chelate.

*Lernaeopoda cluthae* T. Scott, 1900 (p. 173), is referred to this new genus for several reasons. It has no dorsal carapace, no differentiated thorax segments, the posterior processes are dorsal instead of ventral, and the male is radically different from that of *Lernaeopoda,* so that it can not belong to that genus.

On the other hand the female agrees with that of *Lernaeopodina* in every particular except the segmented exopod of the second antennae, and the male corresponds save for the fact that the trunk is segmented. This latter is probably due to the stage of development of the male, since we find similar differences in every genus in the family where the males are known.

We are thus left with the single difference mentioned in the female and may refer the species to the present genus.

*Lernaeopoda similis* T. and A. Scott, 1913, p. 202, for the same reasons just enumerated can not remain in the genus where it was placed. No details are given of the appendages or mouth parts, nor is the male known, yet the excellent colored figures and the brief description leaves but little doubt that the species belongs here in the new genus rather than in *Lernaeopoda.*

*Lernaeopoda spinacis* Brian, 1912, p. 36, is also transferred to the present genus. Brian described and figured both sexes of this species, and while the male agrees with that of *Lernaeopodina* in all essential particulars, the female differs in the fact that it has no posterior processes. This is an important difference but not enough to warrant the erection of a new genus, and as the species shows greater affinity with *Lernaeopodina* than with any other genus in the family it is placed here.

### TABLE OF SPECIES.

1. Second maxillae filiform and definitely longer than the trunk.................. 2.
1. Second maxillae stouter and definitely shorter than the trunk................. 3.
2. Second maxillae three times the length of the trunk; posterior processes cylindrical and half as long as the trunk; maxillipeds small and weak.
*longibrachia* (Brian), 1912, p. 641.
2. Second maxilae but little longer than the trunk; posterior processes flattened and foliaceous; second antennae chelate; maxillipeds large and strong.
*longimana* (Olsson), 1869.
2. Second maxillae but little longer than the trunk; posterior processes cylindrical, but less than one-fourth the length of the trunk; second antennae simple; maxillipeds large and strong..................*cluthae* (T. Scott), 1900.
3. Cephalothorax much elongated; posterior processes conical, slender; egg strings slender and as long as the trunk; dorsal carapace very indistinct.
*similis* (T. and A. Scott), 1913.
3. Cephalothorax short and wide; posterior processes stout, cylindrical; egg strings stout and only half the length of the trunk; dorsal carapace well defined.
*relata*, new species, p. 641.
3. Cephalothorax short, wide, and depressed; posterior processes mere knobs; egg strings stout and as long as the trunk; dorsal carapace well defined.
*spinacis* Brian, 1908.

### LERNAEOPODINA LONGIBRACHIA (Brian).

*Lernaeopoda longibrachia* BRIAN, 1912, p. 39, pl. 2, fig. 5; pl. 12, figs. 1-12.

*Host and record of specimens.*—There is in the collection of the United States National Museum a single female of this species, which is numbered 6087, U.S.N.M., but unfortunately all record of host and locality has been lost.

*Specific characters of female.*—Brian has given a good description and figures of this species, and we may repeat briefly the principal characters. Cephalothorax comparatively small, one-fifth the length and one-fourth the width of the trunk, obovate, covered with a distinct dorsal carapace, and well separated from the trunk; neck short and without grooves; trunk pear-shaped, increasing in diameter from the narrow neck backward, plumply rounded and smooth. A small and degenerate abdomen between the posterior processes; the latter cylindrical, half as long as the trunk, and contracted into a narrow pedicel where they join the thorax. Egg strings cylindrical, half the diameter of the body, and four-fifths as long; eggs small, in 10 or 12 longitudinal rows, about 45 in a row. First antennae four-jointed; second antennae biramose, the endopod (dorsal) somewhat larger than the exopod (ventral), neither of them jointed. First maxillae minute, without a palp and tipped with two setae; second maxillae filiform, of the same diameter throughout, and from two and a half to five times the combined length of the cephalothorax, trunk, and posterior appendages. Maxillipeds rather slender, with a stout spine on the basal joint near the distal end, and an accessory spine on the inner margin of the terminal claw near its tip.

Color (preserved material), a light brownish-yellow.

Total length (without posterior processes), 11 mm. Length of posterior processes, 3 mm.; of egg strings, 11 mm.; of second maxillae, 55 mm. Greatest width of trunk, 5 mm.

(*longibrachia*, long-armed, alluding to the second maxillae.)

*Remarks.*—The distinguishing character of this species is the remarkably long and slender second maxillae, which, as Brian has stated, give the parasite the appearance of a tiny pear suspended by two long threads. No other copepod is known in which the attachment organs reach such a proportionate length.

### LERNAEOPODINA RELATA, new species.

Plate 25, fig. D; plate 39, figs. 99 to 101; plate 40, figs. 102 to 105.

*Host and record of specimens.*—About one hundred specimens of both sexes were obtained from the gills of a large barndoor skate, *Raja levis*, at Harpswell, Maine, August 15, 1913. A single female with an attached male is made the type of the new species and is numbered 43572, U.S.N.M. The remaining specimens are numbered 43576, U.S.N.M., and become paratypes.

*Specific characters of female.*—Cephalothorax short and wide and separated from the body by a well defined groove, the anterior portion covered with a dorsal carapace; trunk pear-shaped, narrowed anteriorly into a long slender neck, prolonged posteriorly into a bluntly rounded point between the egg strings, which represents the abdomen; on either side of this point, and dorsal to the egg strings, is a short cylindrical process, half a millimeter long and curved like a parenthesis mark; they are of the same diameter throughout, with a slight constriction at the base; egg strings only one-third as long as the trunk, but plump; eggs large, in 4 or 5 longitudinal rows, about 10 in each row.

First antennae plump and almost entirely concealed by the second pair, indistinctly jointed and terminated by three short spines. Second antennae large and stout, inclined inward against the mouth tube, and biramose at the tip, the two rami well separated, unsegmented, and curved toward each other at their tips, each armed with one or two stout spines and many smaller ones. First maxillae slender and tipped with two setae; palp short and thick, and also tipped with two setae. Second maxillae about twice the length of the cephalothorax, slender and joined at the tip to a small, button-shaped bulla. Maxillipeds large and stout, the terminal claw long and slender, with an accessory claw on the inner margin, close to the tip, followed by a row of saw teeth; a large roughened knob on the inner margin of the basal joint near the distal end, against which the terminal claw shuts. Color, a uniform creamy white, the bulla transparent. Total length, including posterior processes, 5 mm. Length of cephalothorax, 1.2 mm.; of egg strings, 1.75 mm.; of second maxillae, 3 mm. Greatest width of trunk, 1 mm.

*Specific characters of male.*—Anterior portion of cephalothorax and trunk parallel with each other and with the second maxillae and at right angles to the posterior portion of the cephalothorax; no carapace; trunk conical, tapering rapidly backward, unsegmented, terminating in two short processes, each tipped with a single spine; in side view the trunk does not project beyond the maxillipeds and looks like a third pair of appendages.

First antennae three-jointed; second pair biramose, the rami curved toward each other, and each armed with two stout spines. First maxillae swollen at the base, slender at the tip, terminating in two long setae; no palp; second maxillae slender and tipped with a stout claw, which shuts past a spine on the basal joint, forming a chela. Basal joints of maxillipeds stout, almost squarely truncated at the distal end, and furnished there with a short and strong claw whose tip shuts down into a groove between two rounded knobs.

Color, a uniform creamy-white.

Total length, 0.65 mm. Length of cephalothorax, 0.40 mm.

(*relata*, connecting or establishing a relation between several species, as the type of the new genus).

*Remarks.*—This new species was found in great abundance on the gills of a large barn-door skate, captured in about 60 fathoms of water. Although only 100 specimens were taken there were fully 1,000 on the single fish, the gills being literally covered with them. The present species differs from *longimana* in the details of the mouth parts, in the structure of the second antennae, and in the shape of the posterior appendages; from *longibrachia* it is sufficiently distinguished by the length of the second maxillae.

### Genus BASANISTES Nordmann.

*Generic characters of female.*—Cephalothorax at right angles to the trunk axis, with no definite demarcation between the two; no dorsal carapace, abdomen, anal laminae, posterior processes, or genital process; a large spherical knob on the back of the head, a row of smaller knobs down the center of the back, and another row along either lateral margin. First antennae short, slender, and three-jointed; second pair stout and biramose, the exopod two-jointed, the endopod one-jointed, the latter considerably larger than the former and both armed with small spines. Mandibles slender and curved toward the tips where they are armed with fine saw teeth, all about the same size. First maxillae slender and tipped with three setae; second maxillae short and wrinkled, bulla large and club-shaped. Egg strings cylindrical and rather plump. Maxillipeds stout and standing well in front of the second maxillae, the terminal claw without accessory spines.

*Male.*—Unknown.

*Type.*—*Basanistes huchonis* (Schrank).

(*Basanistes*, *βησανιστής*, a torturer.)

*Remarks.*—Milne Edwards, missing entirely the generic characters in Nordmann's *Basanistes*, made of it a genus to take the place of Blainville's *Lernaeopoda*, and included in it the two species which Blainville had placed under *Lernaeopoda*. Since Blainville's genus was published 10 years before Nordmann's, if it were necessary to choose between the two, Blainville's name would take precedence. But both genera are valid, and so the names which Milne Edwards brought into this genus must be transferred back again.

#### TABLE OF SPECIES.

1. Terminal claw of maxillipeds longer than the second joint, the latter with a stout spine on its ventral surface.........................*coregoni* Neresheimer, 1909.

1. Terminal claw of maxillipeds longer than the second joint, the latter without spines or knobs.........................................*nordmanni* Kessler, 1868.

1. Terminal claw of maxillipeds shorter than the second joint, the latter with a large knob against which the claw shuts like a chela........*huchonis* (Schrank), 1786.

*Generic characters of female.*—Cephalothorax and trunk in the same straight line but separated by a well defined groove; the former short and much broader than long, without a dorsal carapace, the latter elongate, depressed, and indistinctly segmented; no posterior processes, genital process, abdomen, or anal laminae; first antennae short and unsegmented; second antennae uniramose; first maxillae bipartite, without palps; second maxillae straight and rigid, approximated for their entire length and fused at their tips, where they are joined to a mushroom bulla; egg strings filiform and much longer than the trunk.

*Generic characters of male.*—Cephalothorax and trunk in the same line and thoroughly fused, the separation being indicated, if at all, by a slight groove; no dorsal carapace; trunk shorter than the cephalothorax, conical, and bluntly rounded posteriorly, without any abdomen or anal laminae; antennae and mouth parts like those of the female; second maxillae and maxillipeds some distance behind the mouth tube (see pl. 28, fig. N).

*Type.*—*Vanbenedenia krøyeri*, the single species.

(*Vanbenedenia*, to P. J. van Beneden.)

## TRACHELIASTINAE, new subfamily.

*Subfamily characters of female.*—Cephalothorax shorter than the second maxillae, much narrowed and flattened, in line with the trunk or bent a little backward; trunk elongate, flattened dorso-ventrally, enlarged posteriorly, with no traces of segmentation, no posterior processes, genital process, abdomen, or anal laminae; maxillipeds on the inner surface of the second maxillae, and the two removed a long distance behind the mouth tube; second maxillae united only at the tip, bulla mushroom shaped.

*Male.*—Unknown.

*Remarks.*—Since this subfamily includes but a single genus its characteristics for the present will be the same as those of the genus. The most marked character is the juxtaposition of the second maxillae and maxillipeds and their removal a long distance behind the mouth tube.

### Genus TRACHELIASTES Nordmann.

*Generic characters of female.*—Cephalothorax separated from the trunk by a well-defined groove, and usually strongly curved; no dorsal carapace; first antennae indistinctly jointed; second antennae biramose, each ramus unsegmented and ending in a claw; first maxillae tripartite, without a palp; second maxillae long, stout, and wrinkled, united only at the tip to a mushroom-shaped bulla; maxillipeds small, with weak claws; egg strings large and about as long as the trunk.

*Type.*—*Tracheliastes polycolpus* Nordmann.

(*Tracheliastes*, *Τρᾶχηλιάω*, arching the neck like a horse.)

*Remarks.*—This genus, like the subfamily, may be recognized at once by the fact that the maxillipeds have migrated away from the other mouth-parts, along with the second maxillae, the two being found together some distance behind the mouth tube. Nordmann's figures and description were so convincing as to leave no question in regard to the validity of the genus. It has never been disputed, nor has it any synonyms like most of the other genera. Richiardi's species, *gigas*, was simply named with only a few words of description, but the size given, combined with these few words, makes it certain that he had a new species, and hence it has been included in the following table:

TABLE OF SPECIES.

1. Cephalothorax half the length of the second maxillae or more................ 2.
1. Cephalothorax less than one-fourth the length of the second maxillae......... 3.
2. Size small (7.5 mm.); cephalothorax and second maxillae conical; the latter, together with the trunk, covered with rusty spots; genital process present. *maculatus* Kollar, 1835.
2. Size small (6 mm.); cephalothorax and second maxillae cylindrical and much wrinkled; cephalothorax strongly arched; no genital process. *polycolpus* Nordmann, 1832.
2. Size large (35 mm.); cephalothorax flattened and curved forward but not wrinkled; no genital process......................*grandis*, new species, p. 645.
3. Size medium (12 mm.); cephalothorax short, cylindrical; second maxillae slender and tapering and not wrinkled; genital process present....*stellifer* Kollar, 1835.
3. Size large (30 mm.); mouth parts arranged like the sepals of a calyx; anterior third of second maxillae filiform.............................*gigas* Richiardi, 1880.

### TRACHELIASTES GRANDIS, new species.

Plate 40, figs. 106 to 108.

*Host and record of specimens.*—Two females without egg strings and with no label to indicate their host or locality were found in the collection of the Museum. The better of the two has been numbered 43565, U.S.N.M., and is made the species type.

*Specific characters of female.*—Cephalothorax relatively very minute, curved forward ventrally between the second maxillae and much wrinkled; separated from the trunk by a deep invagination on either side and by a dorsal and ventral groove. Trunk massive, strongly flattened dorso-ventrally, gradually enlarged toward the center and then slightly contracted, the posterior margin almost squarely truncated, with a slight invagination at the center and rounded corners; no posterior processes, genital process, abdomen, or anal laminae. The convolutions of the oviducts form a series of slight rounded swellings along either side of the median line. These swellings increase in size posteriorly and are of a darker color that the rest of the trunk.

obscurely segmented; second antennae with a short and stout basal portion made up of two segments, and two conical rami, each apparently unsegmented and ending in a short spine, the exopod nearly twice the length of the endopod. Second maxillae stout, strongly flattened dorso-ventrally, and tapering toward the tips, where they are joined to the slender pedicel of the mushroom bulla. The cephalothorax being curved forward ventrally, the bases of these second maxillae nearly meet on its dorsal surface, and they extend forward anteriorly in line with the body axis.

Maxillipeds large and swollen and inserted on the ventral surface of the bases of the second maxillae, some distance behind the mouth tube; they are made up of two stout conical joints and a strongly curved terminal claw.

Color (preserved material), a yellowish-white, the swellings of the oviducts a light brown, the bulla and its pedicel a dark cinnamon brown.

Total length, including the second maxillae, 38 mm. Length of cephalothorax, 5 mm.; of second maxillae, 10 mm.; of trunk, 32 mm.

Width of cephalothorax, 5 mm.; of trunk, 12 mm. Thickness of the trunk, 7 mm.

(*grandis*, huge or immense, alluding to the trunk.)

*Remarks.*—If the immense size of the trunk and the details of the appendages did not make it certain that this was a new species, the meager material at the author's disposal would not warrant its establishment. Neither female possesses egg strings, the trunk of one is badly mutilated, and there are no data as to host or locality. And yet it will be evident to anyone that the specimens are certainly new and unique in many respects, and accordingly they are put forward as a new species, very much the largest of the genus.

### BRIANELLINAE, new subfamily.

*Subfamily characters of female.*—Cephalothorax about the same length as the second maxillae, bent backward at a right angle with the body axis; trunk plump, with two posterior processes, but with no genital process, abdomen, or anal laminae; trunk unsegmented; maxillipeds minute and degenerate, removed a long distance behind the mouth-tube; second maxillae removed an equal distance behind the maxillipeds, fused throughout their entire length and armed at the tip with a bulla or with dichotomously branched horns, similar to those found in certain of the Lernaeidae; maxillary glands as external swellings on the trunk at the base of the second maxillae.

*Male.*—Unknown.

*Remarks.*—This subfamily just fills out the possibilities in the matter of the arrangement of the second maxillae and maxillipeds with close together, but are removed from the mouth tube; in the Clavellinae one of them is close to the mouth tube while the other is separated, and here in the Brianellinae they are both separated but at different distances. Such a completion affords gratifying proof that the original basis of systematization was well chosen.

### BRIANELLA, new genus.

*Generic characters of female.*—Cephalothorax in line with the second maxillae and at right angles to the trunk axis, considerably longer than the trunk and about the same length as the second maxillae; separated from the trunk by a distinct groove; trunk pear-shaped, with posterior processes dorsal to the egg strings; first antennae rudimentary knobs; second antennae biramose and chelate at the tips; mouth area depressed or telescoped into the anterior surface of the head; second maxillae partially fused, each terminating in a dichotomously branched horn instead of a common bulla; maxillipeds reduced to papillae and terminating in small spines instead of claws.

*Male.*—Unknown.

*Type.*—*Brianella corniger*, new species.

(*Brianella*, to Dr. Alessandro Brian, who has published many valuable memoirs on the parasitic copepods.)

*Remarks.*—In addition to the separation of the second maxillae and maxillipeds from each other and from the other mouth-parts, this genus also offers a striking contrast to every other genus in the Lernaeopodidae in the absence of a bulla and the presence of dichotomously branched horns, similar to those found on the head of some of the Lernaeidae. And yet this is but little different from what we find in the genus *Charopinus*, where the second maxillae are entirely separate and end in enlarged disks, or fingerlike processes. It is but a short step from those processes to these horns, and the two are probably formed in a very similar manner. The removal of the maxillary glands to the cephalothorax is also similar to what is found in several genera of the Clavellinae. This genus, therefore, in its morphology as well as in the arrangement of the mouth parts, stands between the Lernaeopodinae and the Clavellinae.

### BRIANELLA CORNIGER, new species.

Plate 41, figs. 109 to 113.

*Host and record of specimens.*—Two adult females with egg strings were obtained from the gills of a ray off the coast of Lota, Chile. The more perfect specimen is numbered 43573, U.S.N.M., and is

43583 and becomes a paratype.

*Specific characters of female.*—Cephalothorax thick, cylindrical, longer than the trunk, and in line with the second maxillae at right angles to the trunk axis; head not enlarged and without a dorsal carapace; trunk ovoid, flattened dorso-ventrally, contracted anteriorly where it joins the cephalothorax, and smoothly rounded posteriorly; a single pair of posterior appendages dorsal to the egg strings, close together, parallel, and curved dorsally; no genital process, abdomen, or anal laminae; egg strings attached dorsally close to the processes, as long as the trunk and half as thick; eggs small, in 8 or 10 longitudinal rows, about 30 in a row.

First antennae very rudimentary, a mere unsegmented knob inside the second pair; second antennae indistinctly three-jointed and biramose at the tip, the two rami like the jaws of a pair of pincers, and each tipped with a minute spine; basal joint much enlarged, with a wide flattened and laminate process on the posterior margin. The area carrying the mouth tube is depressed or telescoped into the anterior part of the head, so that the mouth does not project beyond the surface. In this depression lie the first antennae and the first maxillae. The second maxillae are separate at their base and for one quarter of their length, then fused solidly. At the base of each maxilla, on the lateral margin where it joins the cephalothorax, is a maxillary gland, trapezoidal in outline, as wide as the maxilla, and projecting prominently. These glands are peculiarly large and their location is a conspicuous one. At the tips of these maxillae we do not find a bulla, but a pair of dichotomously branched horns. Each of these starts from the lateral margin of the maxilla on its own side, and the two extend away from each other; they are twice or thrice compounded and the branches are bluntly pointed. The maxillipeds are situated at the center of the space between the second maxillae and the mouth tube; their basal joints are minute, slender, and triangular in shape, while the terminal claws have degenerated into mere spines at the apex of the basal joints.

Color (preserved material), a dark yellowish-brown.

Length of cephalothorax, 5 mm.; of trunk, 4.75 mm.; of posterior processes, 4 mm.; of egg strings, 4.25 mm. Width of cephalothorax, 1.40 mm.; of trunk, 2.5 mm.

(*corniger*, carrying or wearing a horn, alluding to the second maxillae.)

*Remarks.*—This being the only species of the genus, it follows that it displays all the generic characters, and so becomes of great systematic interest. The remarks already made under the genus apply with equal force here.

*Generic characters of female.*—Cephalothorax half the length of the second maxillæ, the two in the same line and at right angles to the trunk axis; trunk pear-shaped and a little longer than the cephalothorax, indistinctly divided into four segments; two slender posterior processes dorsal to the egg strings; a rudimentary abdomen but no anal laminae; maxillipeds at the center of the space between the second maxillae and the mouth tube, small and rudimentary; second maxillae long and free to their tips where they are joined to an ordinary bulla. First antennae two-jointed, the basal joint the longer; second antennae biramose, exopod much larger than the endopod, both unsegmented; first maxillae tipped with three setae, and bearing a palp with two terminal setae.

*Male.*—Unknown.

*Type.*—*Thomsonella parkeri* (*Brachiella parkeri* Thomson).

(*Thomsonella*, to Prof. George M. Thomson, of the University of New Zealand, who first described the type-species.)

*Remarks.*—This new genus is established for the species described under the name *Brachiella parkeri* by Prof. Thomson in his "Parasitic Copepods of New Zealand,"[1] and afterward (1909) by Miss May E. Bainbridge,[2] who placed a question mark in front of the genus name. That it can not belong to the genus *Brachiella* is at once evident from the position and degeneration of the maxillipeds, as well as from the structure of the other mouth parts. It does not possess a single character assigned to the genus *Brachiella* except the large size and the separation of the second maxillae. It shows a close relationship to the new genus *Brianella* in the position and structure of the maxillipeds and in the general make-up of the entire body. But it differs from that genus in the structure of the first antennae, the mouth tube, and the second maxillae, and may be recognized simply by the presence of the bulla instead of the branched horns. It serves to place the new subfamily on a more secure foundation, and in the possession of a bulla it shows that the same variety exists in the new subfamily as in the older ones.

### CLAVELLINAE, new subfamily.

*Subfamily characters of female.*—Cephalothorax much longer than the second maxillae and often bent backward until it rests against the dorsal surface of the trunk; usually narrow and wormlike; trunk flattened dorso-ventrally, with paired posterior processes, sometimes as many as six or eight, and often with an unpaired genital process; usually no abdomen and no anal laminae; maxillipeds close to the second maxillae removed a long distance behind them, sometimes fused, sometimes separate, usually with a bulla; maxillary glands as external swellings at the base of these maxillae.

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[1] Trans. New Zealand Institute, vol. 22, p. 374.

[2] Trans. Linnaean Society, ser. 2, Zool., vol., 11, p. 52.

*Subfamily characters of male.*—Cephalothorax fused with the trunk, with no traces of segmentation; no anal laminae or only very minute ones; second antennae biramose, but without a claw; in *Brachiella* and its relatives the cephalothorax and trunk are in the same line or the body is somewhat curved; in *Clavella* and its relatives the body is folded together ventrally with no distinction of cephalothorax and trunk.

*Remarks.*—This subfamily is considerably the largest of the four and includes all the more degenerate genera. Since it has also been the least well known and has served as a sort of wastebasket to catch such forms as could not readily be located elsewhere, more changes have been necessary and a much larger number of new genera have been introduced. The figures and the diagnoses given, however, will readily prove the validity of these genera, which are largely due to the differential characters of the males, here for the first time presented.

### Genus THYSANOTE Krøyer.

*Generic characters of female.*—Cephalothorax in line with the trunk, short, thickset, flattened dorso-ventrally, and completely fused with the trunk or only imperfectly separated; trunk unsegmented, flattened like the cephalothorax, with no genital process, abdomen, or anal laminae; a pair of fingerlike posterior processes ventral to the egg strings; branched or unbranched fimbriate processes attached to the posterior margin of the second maxillae, to the body at the base of the second maxillae, and to the posterior corners of the trunk, sometimes hiding the egg strings. First antennae indistinctly segmented; second antennae biramose; first maxillae large, tripartite; second maxillae united only at their tips, bulla mushroom-shaped; maxillipeds large and powerful; egg strings usually short and stout.

*Generic characters of male.*—Cephalothorax in line with trunk axis, the two curved into a quarter moon and separated by a distinct groove; no dorsal carapace; trunk spindle-shaped, unsegmented, and terminated by two conical anal laminae, which are curved ventrally; mouth-tube and appendages at right angles to the body axis; second antennae uncinate; second maxillae and maxillipeds with stout sickle-shaped claws, one or both of them sometimes twisted like a corkscrew.

*Type.*—*Thysanote pomacanthi* Krøyer.

(*Thysanote*, *θύσανος*, a fringe, alluding to the fimbriate processes.)

*Remarks.*—This genus may be recognized at once by the fimbriate processes, whose dense fringe causes some of the species to bear a crude resemblance to a miniature human figure. The genus type shown by the male is fully as distinct as that of the female, and this has differentiated the genus so thoroughly that there has been almost no false identification of the species (see pl. 26, fig. G).

### TABLE OF SPECIES.

1. Fimbriate processes few in number and well separated........................ 2.
1. Fimbriate processes numerous and thickly massed............................ 3.
2. Processes unbranched, club-shaped..*appendiculata* (Steenstrup and Lütken), 1861.
2. Processes dichotomously branched..............*longimana* Wilson, 1913, p. 651.
3. Second maxillae with three single processes; a single bundle of unbranched processes on either side of the trunk at the posterior end....*fimbriata* (Heller), 1865.
3. Second maxillae with four bundles of processes; two similar bundles at the posterior end of the trunk, all dichotomously branched........................... 4.
4. Posterior fimbriate processes recurved at the tips and entirely concealing the egg strings......................................*pomacanthi* Krøyer, 1863, p. 651.
4. Posterior processes straight, egg strings visible for half their length. *lobiventris* (Heller), 1865.

### THYSANOTE LONGIMANA Wilson.

*Thysanote longimana* Wilson, 1913, p. 257, pl. 47, figs. 262–264; pl. 48.

*Host and record of specimens.*—Five females and three males were obtained from the throat of the red snapper, *Neomaenis aya*, at Montego Bay, Jamaica, July 23, 1910, and both sexes are fully described in the reference given above. Since the host is found all along our Atlantic Coast as far north as Connecticut this parasite also may be classed as North American.

### THYSANOTE POMACANTHI Krøyer.

*Thysanote pomacanthi* Krøyer, 1863, p. 288, pl. 15, fig. 1*a* to *i*.

*Host and record of specimens.*—Krøyer obtained 10 females from the gills of *Pomacanthus paru* in the Danish West Indies. M. T. Thompson recorded in his manuscript notes two females of this species from the gills of *Pomacanthus arcuatus* in the local collection at Woods Hole, Massachusetts. From the sketches and data accompanying this record it is certain that the specimens really belonged to this species, so that it may be recorded as North American. These specimens, however, can not be found, and hence no attempt is made to supplement Krøyer's description.

### THYSANOTELLA, new genus.

*Generic characters of female.*—Cephalothorax curved forward and nearly as long as the trunk; the latter much the wider, with concave sides, each of the four corners prolonged into a single bundle of four filiform, unbranched processes; two pairs of posterior processes, one dorsal, the other ventral, close to the midline, with a tiny genital process between them. First antennae three-jointed; second antennae biramose, without claws; first maxillae bipartite, palp with a single center, bulla disk-shaped; maxillipeds stout, terminal claw slender; egg strings club-shaped, and as long as the trunk.

*Generic characters of male.*—Cephalothorax ovoid, in line with the trunk and separated from the latter by a distinct groove; no dorsal carapace; trunk two-thirds the length and only one-fifth the diameter of the cephalothorax, distinctly divided into three segments and terminating in two lancinate plates.

First and second antennae close togethér at the upper and anterior corner of the cephalothorax, a considerable distance from the mouth tube; first antennae three-jointed; second pair uniramose and two-jointed; maxillipeds relatively enormous, the claw very powerful, bent so as to form three-quarters of a circle, and sharp pointed, with an accessory spine on the inner margin.

*Type.*—*Thysanotella multifimbriata* (Bassett-Smith).

(*Thysanotella*, the diminutive of *Thysanote.*)

*Remarks.*—This genus is established to include a single species described and figured by Bassett-Smith (1898, p. 96, pl. 6, fig. 2, *a* to *g*). Both sexes are known, and each differs so markedly from the types of the other genera that the validity of the genus is securely established, provided Bassett-Smith's description was correct. In the female the long and wormlike cephalothorax is like that found in *Eubrachiella*, *Clavella*, and *Charopinus*, but very different from that found in *Thysanote;* the fimbriate processes are all on the trunk, and there are two pairs of posterior processes. The entire make-up of the male is peculiar; the body is reduced to less than a quarter the size of the cephalothorax, but is distinctly segmented; the two pairs of antennae are away up on the back of the cephalothorax, and the maxillipeds are enormously developed and peculiar in position. Bassett-Smith himself says of this male: "It shows distinctly the *Brachiella* form." But from the figure here given (fig. H, pl. 26) it will be seen that it conforms far more to *Charopinus* than to *Brachiella*. He tells us that he only succeeded in making a rough drawing of this male and that he lost the specimen while preparing it for mounting. But granting this, no amount of correcting or finishing could ever cause his figure of the male to bear any resemblance to that of *Brachiella* or *Thysanote.*

## Genus CHAROPINUS Krøyer.

*Generic characters of female.*—Cephalothorax elongate, cylindrical, more or less distinctly separated from the trunk, sometimes turned back at right angles or even against the dorsal surface of the trunk; usually no dorsal carapace; trunk pear-shaped, enlarged and often flattened posteriorly, and carrying there a pair of filiform posterior processes, dorsal to the egg strings; no genital process, abdomen or anal laminae. First antennae indistinctly four-jointed; second two minute spines; second maxillae long and usually quite corrugated, sometimes joined at their tips and furnished with a bulla, sometimes separate, with their ends enlarged in various patterns and clasping a chitin bar; maxillipeds with a short terminal claw, shutting against a projection on the second joint.

*Generic characters of male.*—Anterior portion of cephalothorax at right angles to the posterior portion and the trunk; no distinct dorsal carapace; thorax segmented with an enlarged genital segment; a well-defined and segmented abdomen, carrying anal laminae. First antennae indistinctly four-jointed; second antennae biramose, rami usually curved and chelate; first maxilla tripartite, palp with two setae; second maxillae and maxillipeds some distance behind the other mouth parts and close together.

*Type.*—*Charopinus dalmanni* (Retzius).

(*Charopinus*, the name of a parasite in Martial.)

*Remarks.*—Krøyer's description of the species (*dalmanni*) which he made the genus type, and of a new species *ramosus*, and the details given in his figures, leave no doubt that the "new" genus and species, *Stylophorus hippocephalus*, proposed by Hesse in 1878, is really only a new species of *Charopinus*. To these three species Scott added a fourth, *dubius*, in 1900, but if one will examine the figures and description in the same paper (1900, p. 173) of the species which Scott named *Lernaeopoda cluthae*, it will be evident that this also belongs to the present genus and not to *Lernaeopoda*. This genus is the only one in the entire family in which the adult male is completely segmented, while the male of *Lernaeopoda* shows no segmentation whatever. In particular the partial or complete separation of the two segments bearing the second maxillæ and maxillipeds is characteristic of the male *Charopinus*, and this is admirably shown in Scott's figure. His species, therefore, must be removed from the genus *Lernaeopoda* and placed here with the other species of *Charopinus*. Exactly the same statements apply to the species called *Brachiella malleus* by Nordmann (1832, p. 95) and Vogt (1877, p. 46), and also to the species named below (*dentatus*), in each of which the male proves beyond a doubt that the species belongs to the genus *Charopinus*. It will be noted also that every species of the genus as here constituted is parasitic upon the gills or in the nasal openings of a ray.

### TABLE OF SPECIES.

1. Tips of second maxillae completely fused and furnished with a bulla for attachment to their host.......................................... 2.

1. Second maxillae entirely separate or slightly coalesced, the tip of each enlarged and anchored separately in the host.......................................... 3.

*dubius* (T. Scott), 1900.

2. Second maxillae the same length as the trunk; bulla thick and narrow. *cluthae* (T. Scott), 1900.

2. Second maxillae half the length of the trunk; bulla thin and narrow. *malleus* (Rudolphi), 1832, p. 654.

2. Second maxillae one-third the length of the trunk; bulla small and mushroom shaped; no posterior processes .................. *dentatus* (Wilson), 1912, p. 654.

3. Ends of second maxillae slightly coalesced, branched separately; posterior processes short, curved .................................. *ramosus* Krøyer, 1863.

3. Ends of second maxillae enlarged into semilunar disks; posterior processes strongly curved .................................. *dalmanni* (Retzius), 1829, p. 655.

3. Ends of second maxillae terminating in finger-like projections; posterior processes short and divergent .................................. *hippocephalus* (Hesse), 1879.

3. Ends of second maxillae enlarged into semielliptical disks, which are slightly coalesced at the center; no branches or projection; posterior processes short and straight .................................. *bicaudatus* (Krøyer), 1837, p. 656.

### CHAROPINUS MALLEUS (Rudolphi).

*Brachiella malleus* NORDMANN, 1832, p. 95.—VOGT, 1877, p. 46, pl. 3, figs. 1-8.

*Host and record of specimens.*—A single lot of females with egg strings broken was taken at Port Arthur, Manchuria, by J. F. Abbott, and were sent to the author from Stanford University by Dr. C. H. Gilbert; there is no record of the host or date of capture. These parasites have been given Cat. No. 38578, U.S.N.M.

*Remarks.*—This species was first described in manuscript notices by Rudolphi in 1817 under the name *Dirhynchus malleus*. These notices were handed over to Nordmann, who published the species in 1832 as *Brachiella malleus*, with a short description but no figure. In 1877 Vogt published a more elaborate description, accompanied by excellent figures, and it has been noted by many subsequent investigators. The type of male however, which is admirably portrayed by Vogt, is very different from that belonging to the genus *Brachiella*, but is like *Charopinus*, and accordingly is transferred to this latter genus.

### CHAROPINUS DENTATUS (Wilson).

*Brachiella dentata* WILSON, 1912, p. 97, pl.9.

*Host and record of specimens.*—Six lots of this species, numbering twenty to twenty-five specimens each, and including both sexes, were obtained by Rev. George W. Taylor, former director of the Pacific Coast Biological Station at Nanaimo, British Columbia. They were taken from the gill arches in the throat of the large skate, *Raja binoculata*, and the lots have received, respectively, Cat. Nos. 38636, 38642, 38643, 38644, 39537, and 39540, U.S.N.M.; the first lot were made the types of the species.

*Remarks.*—Both sexes of this species were fully described and figured in the paper referred to above, and at the time the manuscript was written they were referred to the genus *Brachiella* in consequence of the structure of the second maxillae. A more careful study of both sexes and especially of the male, in the light of the differentiations here established, shows that the species belongs to the genus *Charopinus* and not to *Brachiella*, and it is here transferred, with the necessary change in the adjective (see pl. 26, fig. I).

This and the two following species are the only ones thus far found in North American waters.

### CHAROPINUS DALMANNI (Retzius).

*Lernaea dalmanni* Retzius, 1829, p. 109, pl. 6.

*Lernaeopoda dalmanni* Krøyer, 1837, p. 264, pl. 2, fig. 11; pl. 3, figs. 4*a* and 4*b*.

*Charopinus dalmanni* Krøyer, 1863, p. 280, pl. 14, fig. 6, *a* to *g*.—T. Scott, 1900, p. 169, pl. 8, figs. 6 to 10.

*Host and record of specimens.*—Two females with egg strings were obtained from the nostrils of a skate at Polperro in 1884, and were sent to the United States National Museum by Rev. A. M. Norman, of England. They were numbered 12909, U.S.N.M. Another lot of three females with egg strings was obtained from the nostrils of the barndoor skate, *Raja levis*, at South Harpswell, Maine, July, 1913, by the author. These have received Cat. No. 43575, U.S.N.M.

*Remarks.*—The description and figures published by Retzius, although in many respects imperfect, leave no doubt as to the identity of the parasite. And when supplemented by the excellent work of Krøyer and T. Scott there is practically nothing to be added except a few comments upon the morphology, and one or two corrections. Turner and Wilson published, in 1862, an extended account of the present species, including observations on its larval form. Their figures are admirable, but whatever value their description may possess is greatly diminished by the fact that they mistook the ventral for the dorsal surface, and have not named correctly a single appendage except the second antennae, whose nomenclature they borrowed from Krøyer. The "eyelike" spots noted by Retzius and Krøyer on either side of the thorax in front of the base of the second maxillae are doubtless the maxillary glands, which often appear in other genera of this family in the form of protuberances upon the external surface of the cephalothorax. During the migration forward of the maxillipeds and the migration backward of the second maxillae, these glands are sometimes drawn out of the maxillae into the body of the cephalothorax. Turner and Wilson describe what is evidently the body of the gland and the excretory duct leading from it. The posterior appendages are said by every investigator who has described the species to spring from the ventral surface of the body in front of the egg strings. But they are just as certainly dorsal as in *ramosus* and the other species of the genus. If the cephalothorax be straightened up into line with the rest of the body, the mouth parts are of course on the ventral surface, and the posterior appendages are just barndoor skate upon our own coast makes it necessary to include it in the North American fauna.

### CHAROPINUS BICAUDATUS (Krøyer).

Plate 41, figs. 114 to 118; plate 42, figs. 119 and 120.

*Lernaeopoda bicaudata* Krøyer, 1837, p. 275, pl. 3, fig. 11.

*Brachiella pastinacae* P. J. van Beneden, 1851, p. 118, pl. 4, figs. 8, 9.—Kurz, 1877, p. 389, pl. 25, figs. 2, 3.

*Brachiella pastinaca* Bainbridge, 1909, p. 50, pl. 8, figs. 6, 7; pl. 9, fig. 8.—T. and A. Scott, 1913, p. 211, pl. 64, fig. 8.

*Host and record of specimens.*—Eight females with egg strings were obtained from the spiracles of the common dogfish, *Squalus acanthias*, by Dr. F. D. Lambert at South Harpswell, Maine, July, 1912. They have received Cat. No. 43536, U.S.N.M.

*Specific characters of female.*—Cephalothorax short and wide, and inclined at an angle of 45° to the trunk axis; a narrow dorsal carapace divided longitudinally through the center, the two halves resembling closely the elytra of beetles, and diagonally truncated anteriorly; trunk somewhat pear-shaped, narrowed into a long and slender neck anteriorly, swollen into a sphere posteriorly, and flattened dorso-ventrally; posterior processes cylindrical, plump, dorsal to the egg strings and half the length of the latter, and inclined backward; egg strings stout, cylindrical, and about the same length as the trunk; eggs in 8 longitudinal rows, about 18 eggs in the longest row.

First antennae two-jointed, the basal joint considerably swollen and armed on the anterior margin with a long and stout spine, the terminal joint narrower and tipped with two olfactory cylinders and a small spine; second antennae biramose, both rami unsegmented, the endopod considerably larger than the exopod, and both of them covered with small spines and bristles. Mandibles long and narrow, with four large principal teeth, two smaller secondary teeth, and two intermediary teeth. First maxillae tripartite, the outer ramus smaller than the other two, palp large and tipped with two setae. Second maxillae slender and cylindrical, two-fifths as long as the trunk and enlarged at the tip into a crescent or semicircle, at right angles to the axis of the maxilla. Maxillipeds with a stout basal joint, armed on the inner margin with two knobs covered with spines and a large solitary jointed spine; terminal claw slender, with an accessory claw at the tip on the inner margin.

Color (preserved material), a uniform yellowish white.

Cephalothorax, 2.20 mm. long, 1.25 mm. wide. Trunk, 3.75 mm. long, 2 mm. wide, 1.60 mm. thick. Egg strings, 2.75 mm. long. Posterior processes, 1.10 mm. long.

(*bicaudatus*, *bis*, two, and *caudatus*, tailed, alluding to the pair of small posterior processes, looking like two tails.)

that has ever been found upon the common dog American coasts. Doctor Lambert has handled specimens for laboratory purposes, and this is which any copepods have been found upon therefore, can not be at all common; it may be by the divided carapace, the slender neck, usua and the plump posterior processes.

This species was discovered by Krøyer in 1837 the genus *Lernaeopoda*, but he placed a question name and said in the context: "There is some d this Lernaean should be referred to the genus *Brach* or whether it should be made the type of a new g was afterwards described by Beneden under t *pastinacae*; it has since been noted by Kurz (1 Bainbridge (1909), and T. and A. Scott (1913), several lists. In some of these the specific nam in others in a diphthong; it ended originally in it really belongs in the genus *Charopinus* is cle backward flexion of the cephalothorax, by the e second maxillae, and by the structure of the firs maxillae. The description and figures given b (1909) are the best that have been thus far publi differences are noted in the present specimens. have only two joints instead of four, and are exact by Miss Bainbridge (pl. 9, fig. 8). The teeth on t spond with those given by Miss Bainbridge, and a from the ones figured by Kurz. There are no tra slender clawed appendages" at the sides of the m Miss Bainbridge. It would be very difficult to these would represent, if present. That they can palps," as suggested by Thomson for his *Brac* quoted by Miss Bainbridge, is at once evident wh the maxillae already have well-developed palps. British specimen of *Brachiella parkeri* Miss Bainb the structures designated "maxillary palps" by the specimens here described the present autho structures noted by Miss Bainbridge. It seems cases, therefore, that they were accidental rather

### Genus NAOBRANCHIA Hess

*Generic characters of female.*—Cephalothorax na and well separated from the trunk; a minute carapace on the head; trunk broad and well r

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[1] Miss May E. Bainbridge, now the Hon. Mrs. Henn C

abdomen well differentiated and carrying anal laminae; egg strings extending in front of the oviduct as well as behind it, and inclosed in a membrane, strengthened by ribs.

First antennae three-jointed; second antennae biramose, the exopod two-jointed, the endopod simple; first maxillae bipartite, without a palp; second maxillae in the form of bands, containing longitudinal muscles, which clasp around the gill filaments of the host; no bulla; maxillipeds of the usual pattern; a pair of spoon-shaped palps attached either to the second joint of the maxillipeds, or to the ventral surface of the head.

*Generic characters of male.*—Cephalothorax and anterior trunk in the same line and indistinguishably fused, without any trace of segmentation, the two covered with a dorsal carapace; posterior trunk turned ventrally at right angles to the anterior portion, and projecting from beneath the posterior end of the carapace as a large process behind the second maxillae; anal laminae small, sometimes entirely lacking. First antennae three-jointed; second antennae biramose, the exopod jointed and chelate, the endopod simple; first maxillae bipartite, without a palp; second maxillae and maxillipeds removed some distance behind the other mouth parts, about the same size and armed with stout claws.

*Type.*—*Naobranchia cygniformis* Hesse.

(*Naobranchia, ναίω,* inhabiting and *βράγχια,* gills.)

*Remarks.*—This genus is one of the most interesting in the entire family. The female can be recognized at once by the flattened muscle bands which serve for second maxillae, and by the fact that the egg strings are carried inside of a protecting membrane. The anterior part of the body of the male is similar to that of *Thysanote,* but the posterior body is bent sharply at a right angle and projects ventrally like an unpaired appendage behind the second maxillae. These characters will distinguish either sex at a glance, and since they are so totally different from all other genera it follows that an account of the internal as well as the external morphology of the genus ought to be interesting as well as instructive. From serial sections of *Naobranchia lizae* we learn that the mouth tube, as in most other genera, is the most anterior portion of the body. Through it runs the thread-like esophagus (*oe,* fig. 121), which is bent more sharply than in *Achtheres* and *Clavella,* and which extends a considerable distance behind the maxillipeds. It enters the stomach at the center of the anterior end, the entrance being surrounded by a rather weak sphincter muscle. The anterior portion of the stomach (*s*) is thrown into a series of fairly regular transverse folds by alternate constrictions and enlargements. When it reaches the bases of the second maxillae these folds abruptly cease without any change trifle upward nearer to the dorsal surface of the body and opens at the anus (*a*). The cells of the glandular layer of the stomach and intestine are similar to those of other genera (figs. 123, 126, 133). The frontal gland (*fg*, fig. 122) is at the extreme anterior portion of the head and is proportionally very small. This genus is not permanently fastened to its host by any bulla or frontal filament, and hence a much smaller gland is sufficient. The second maxillae are flattened into a thin ribbon and the maxillipeds are extremely minute. Hence, there are no excretory glands in either of them, but there is a pair of large glands in what may be called the shoulders of the trunk, opposite the bases of the second maxillae and above the tips of the egg strings (fig. 125). The infra- and supra-esophageal ganglia are exceptionally large, and there is not the disparity in size between them that was noted in *Achtheres* (*ig*, *sg*, fig. 122).

Each ganglion shows the usual nerve connections with the various appendages, but the large posterior nerve (*p*), which runs back along the floor of the neck and trunk, is given off from the ventral surface of the infra-esophageal ganglion and not from its posterior end. The cement glands are in the posterior part of the body on either side of the intestine. The ovary and uterine processes of the oviducts are arranged similarly to those of *Achtheres*. On examining cross sections of the second maxillae it is found that in the process of becoming flattened they have also undergone other changes. On the outer surface of the maxilla there is a thin layer of ordinary skin (*s*, fig. 124); immediately beneath this are the three bundles of muscles (*m*) symmetrically arranged, one at the center and one at a little distance toward each lateral margin. Each muscle runs along its own cylindrical tube and is distinct from the others, but the tubes are connected across the two intervals by open spaces (*o*) in which may be found a thin muscular ribbon. That portion of the maxilla on the inner side of the muscles is much thicker than the outer skin and has become solidified into a homogeneous mass in which there is no longer any distinction of dermis, epidermis, and subcutaneous tissue (*n*, fig. 121). This mass has every appearance of cartilage and takes a cartilage stain. On the contrary, the blunt claws at the tips of the maxillae take the eosin, but do not take the haematoxylin.

### TABLE OF SPECIES.

1. Egg strings reaching forward nearly to the base of the second maxillae; abdomen reaching backward nearly to the tips of the egg strings. . *lizae* (Krøyer), 1863, p. 660.
1. A long interval between the second maxillae and the egg strings; abdomen scarcely reaching the center of the latter........................................ 2.
2. Cephalothorax much longer than the rest of the body and filiform.
*cygniformis* Hesse, 1863.

**3. Egg strings longer than the trunk and parallel...........*amplectens* (Kurz), 1877.**

**3. Egg strings much shorter than the trunk and inclined toward each other.**
***occidentalis*, new species, p. 663.**

### NAOBRANCHIA LIZAE (Krøyer).

Plate 27, fig. J; plate 42, figs. 121 to 124; plate 43, figs. 125 to 132; plate 44, figs. 133 to 135.

*Anchorella lizae* **Krøyer**, 1863, p. 29, pl. 16, fig. 11 *a* to *c*.

*Host and record of specimens.*—Four adult and two young females and two males were obtained by Dr. Edwin Linton from the gills of the common mullet, *Mugil cephalus*, at Beaufort, North Carolina, July 10, 1901. They are numbered 39611, U.S.N.M. Doctor Linton states that other specimens were found later the same year, and still others during the following years, so that it is fairly common on the mullet.

*Specific characters of female.*—Cephalothorax cylindrical, longer than the trunk and tapering gradually and uniformly; head exceptionally small, neither enlarged nor separated from the neck and covered with a minute dorsal carapace; neck slender and separated from the trunk by a well defined dorsal groove and ridge; trunk rectangular, with rounded corners, three-fifths as wide as long, and strongly flattened dorso-ventrally; anterior portion of the trunk making up the full width, posterior portion much narrowed, with the rectangle filled out along the lateral margins by the egg strings. In young females the genital segment is well differentiated, somewhat enlarged, with strongly convex sides, which are prolonged into a pair of stout conical posterior processes on a level with the ventral surface. To each of these processes is attached one end of the rib, which supports the membrane covering the egg string on that side. Inside of these processes there is a short and narrow one-jointed abdomen, to the posterior margin of which is attached a pair of minute conical anal laminae. In the adult female this abdomen is practically absorbed into the genital segment, the only indication of it being the anal laminae. The egg strings are peculiar in being turned forward along the lateral margins of the trunk and backward a little beyond the tips of the posterior processes. They are club-shaped, largest near the posterior ends and tapering rapidly anteriorly. They are a little more dorsal than ventral, especially at the posterior ends. They are covered and held securely in place by a transparent membrane, strengthened by a rib which runs along the center of the outer surface (fig. 127), turns dorsally at the posterior end, runs forward a little ways, and then turns inward to the dorsal surface of the trunk (fig. 132). The eggs are rather large and not arranged in rows, from 150 to 175 in each egg string. The two egg strings touch dorsally at their widened posterior ends, but are separated ventrally by the enlarged genital segment.

First antennae short, slender, conical, the basal joint much enlarged, the two terminal joints narrowed; second antennae biramose and turned down squarely across the frontal margin, both rami one-jointed, the endopod (dorsal) half as long again as the exopod and bluntly rounded, the exopod with two short spines at the tip and a short, one-jointed process on the ventral surface. The mouth-tube is broadly conical and extends beyond the tips of the second antennae. The first maxillae are short, stout, bipartite, and destitute of a palp. The second maxillae are comparatively long and wide. Each is flattened into a broad band of cartilaginous substance, manipulated by three longitudinal muscles. These bands pass entirely around the gill filament, and thus hold the parasite securely in place. The nature of these second maxillae has puzzled all the observers who have thus far described any species of this genus. Does each of the ribbonlike bands represent a separate maxilla? Or does the right half of both bands represent the right maxilla and the left half the left maxilla? If the former, does each maxilla extend around the filament from its own side, or do they both start from the same side? If the latter, how are the bands joined where they meet? In adult specimens these maxillae are so completely fastened that one can get no idea of the way in which they are formed.

Fortunately, one of the specimens obtained at Beaufort was a young female in which the second maxillae were not yet fully developed, and this specimen (fig. 128) answers our questions for us. Each band represents a separate maxilla, and the two are anterior and posterior instead of right and left. Furthermore, both bands started on the midline of the ventral surface of the cephalothorax and extended around the filament from the left to the right side of the parasite. Here on the right side and sunk into the surface of the cephalothorax are two sockets, into which the blunt claws on the tips of the maxillae fit. The claws and the sockets are gradually fused together, until in the adult they can no longer be separated. Each maxillae, therefore, corresponds to an ordinary maxilla flattened laterally. As these maxillae migrated toward the ventral midline the base of one moved a little forward and the base of the other a little backward, so bringing the two into line. From the arrangement of the claw on the tip of each maxilla it would seem as if there was no orientation during this migration. After the migration the maxillae extended around the filament, with the inner surface of the left hand one and the outer surface of the right hand one next to the filament.

curved, terminal claw, armed with a blunt spine on its inner margin near the center. Outside of and a little behind the maxillipeds, on the lateral margins of the head, are located the peculiar appendages noted by both Hesse and Kurz, but apparently overlooked by Krøyer in the present species. Each is ovate in outline, thin, convex outwardly and concave inwardly, and is attached by a narrow neck to the lateral margin of the head just behind the carapace. In the present species they are relatively so small and they lie so close to the surface of the head that they are easily overlooked (see p. 664).

Color, a uniform white; eggs strings a faint pink or flesh color; alimentary canal a deep black, most conspicuous in the neck, where it appears as a broad black band with undulating margins; second maxillae yellowish (Doctor Linton's manuscript notes).

Total length, 8.4 mm. Length of cephalothorax, 3.4 mm.; of egg strings, 2.25 mm.; of trunk, 3 mm.; of second maxillae, 2.5 mm.

Width of cephalothorax, 0.5 mm.; of trunk, 1.85 mm.; of second maxillae, 0.9 mm.

*Specific characters of male.*—General form ovate, the head at the pointed end; cephalothorax and anterior trunk in the same line and covered with a dorsal carapace; posterior trunk at right angles to the rest of the body. First antennae slender and indistinctly three-jointed; second antennae biramose, the two rami about the same length, the endopod one-jointed and bluntly rounded, the exopod two-jointed and tipped with a short curved claw; mouth tube broadly conical and pointed ventrally, much longer than the antennae; first maxillae bipartite and without a palp, attached to the side of the mouth tube at about its center, with the tips of the setae projecting a little beyond the end; second maxillae and maxillipeds almost exactly alike, relatively large, with massive basal joints and short curved terminal claws; behind the second maxillae projects ventrally a broad conical genital process, somewhat corrugated at its tip.

Color, a light yellow.

Total length, 0.26 mm. Greatest diameter, 0.13 mm.

(*lizae*, from Krøyer's specific name (*Mugil liza*) of the host.)

*Remarks.*—One specimen of this species was obtained by Krøyer from the gills of "*Mugil liza*" (*M. curema*) near New Orleans, Louisiana, and was described and figured in his Bidrag till Kundskab om Snyltekrebsene. The specimen was a young female, 3 mm. in length and without egg strings, and he referred it to the genus *Anchorella*. But he added that if his view of the structure of the attachment apparatus was correct the species might properly be considered the type of a new genus. In the same year (1863) Hesse published[1] the description and figures of a new genus and species which he

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[1] Ann. des Sci. Nat. (4), Zool., vol. 20, pp. 122 to 132, pl. 1, fig. 1, *a–f*.

*lizae.* In 1877 Kurz in his Studien der Lernaeopodi
a new genus and species which he designated *Cestop*
He was thoroughly familiar with Krøyer's paper and
quotations from it, and concluded that his specimens
"certainly belong, if not to the same species, at leas
genus." He added that the data with reference to K
which are necessary to enable us to tell whether the tw
are lacking. If he could have had the data here prese
have seen at once that the two species are distinct.
seems to have entirely overlooked Hesse's paper, and
species is a third one belonging to the same genus, the
gave to that genus must stand, and "*Cestopoda,*" gi
becomes a synonym. The distinctive characteristics
species are the comparatively great width of the secon
elongation of the trunk, and the form and position of t
In the other species some of the eggs are carried i
opening of the oviduct, but the great majority are beh
egg strings taper posteriorly; here only a few of the e
behind the opening, while the great majority are in fron
egg strings taper anteriorly. The male also, which is
for the first time, serves to distinguish the species.
prominent genital process is especially noteworthy,
similarity in size and structure between the second ma
maxillipeds.

### NAOBRANCHIA OCCIDENTALIS, new species.

Plate 44, figs. 136 to 139.

*Host and record of specimens.*—Five adult females
were obtained from the gills of the Pacific cod, *Gadus*
at Chignik Bay, Alaska, August 7, 1903, by the Burea
steamer *Albatross* during the Alaska salmon investi
best female has been selected as the type and nun
U.S.N.M. The remaining specimens with the male bec
and have been numbered 39567, U.S.N.M.

*Specific characters of female.*—Cephalothorax about th
as the trunk, much enlarged and wrinkled at the base, ta
the head, where it is considerably smoother; head not
covered with a minute and smooth dorsal carapace; n
separated from the trunk by a deep dorsal groove and s
on the sides; trunk triangular, much flattened dorso-
posterior corners of the triangle projecting over the egg
terior margin inclined on either side toward the genital

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[1] Zeit. fur wiss. Zool., vol. 29, p. 407.

absorbed into the trunk.

First antennae indistinctly three-jointed, the basal joint enlarged; second antennae with a two-jointed exopod and a one-jointed endopod, the latter much longer than the former.

Mouth tube a broad cone, overlapping the tips of the second antennae; first maxillae bipartite and rather stout, without a palp. Second maxillae narrow, but each maxilla with three longitudinal muscles, as in the preceding species. Maxillipeds with a broad triangular basal joint and a short terminal claw. Just behind the base of each maxilliped is a spoon-shaped appendage as large as the entire head and attached to the ventral surface of the head by a narrow base. In nearly all the preserved specimens these appendages project from the head like a pair of enormous ears, but in one specimen they are turned forward and laid down over the mouth parts as though to protect them. Kurz says that in the live animal they project hardly at all. He calls them sucking disks and says that they have the same form and structure as the lunules in *Caligus*. He does not show such a structure, however, in the figure given, and certainly in the present and the preceding species they have nothing resembling that structure (see p. 662). When inflated and standing out sidewise, they cause the head to look something like a pawnbroker's three-ball sign.

Color (preserved material), yellowish-white.

Total length (without egg strings), 8 mm. Length of cephalothorax, 4 mm.; of trunk, 4 mm.; of egg strings, 3.6 mm. Width of cephalothorax at base, 1.65 mm.; of trunk, 2.8 mm.; of egg strings, 1.65 mm.; of second maxillae, 0.5 mm.

*Specific characters of male.*—General form ovoid, head at the pointed end; cephalothorax and anterior trunk covered with a carapace, posterior trunk turned at right angles and terminating in a pair of anal laminae. First antennae indistinctly jointed; second antennae biramose and no longer than the first pair, endopod bluntly rounded, exopod two-jointed and ending in a minute chela; first maxillae bipartite and without a palp; second maxillae longer than the maxillipeds and projecting well from the ventral surface, with a slender terminal claw; genital process wide and long, its sides roughened by many ridges and grooves.

Color, a grayish-white.

Total length, 0.66 mm. Greatest width, 0.33 mm.

(*occidentalis,* western, being the first species from the Pacific coast of North America.)

*Remarks.*—The facts brought out in the description of these two species enable us to supplement and correct the interpretations of Krøyer, Hesse, and Kurz in the following particulars:

The head is covered by a minute, but distinct, dorsal carapace. The second antennae are biramose, the exopod two-jointed, the endopod one-jointed. The first maxillae are bipartite and have no palp. The egg strings are attached, not at the proximal ends, but on one side, and to the trunk (genital segment) in front of the abdomen. The covering of the egg strings is a thin membrane, which is probably elastic, but is not "muscular."

The strange structures outside of and behind the maxillipeds seem at first sight anomalous, but Hesse describes and figures them in *cygniformis* as occurring on the second joint of the maxillipeds.

In comparison with the other species it is doubtful whether they actually do occur on the maxillipeds; but however that may be, they are certainly closely connected with those organs and may possibly represent palps. They do not show the structure of sucking disks, as most of the authors would have us believe, either in surface view or in sections, and it is extremely doubtful if they ever function in that manner. The modified second maxillae are universally designated as "muscle bands," but when examined in sections they are found to be epithelial and cartilaginous rather than muscular. The muscles are in the form of three bundles of fibers running lengthwise of the bands, which probably represent the ordinary longitudinal muscles of the second maxillae. How this attachment apparatus is formed in the copepodid larva and how it is thrown around the gill filament of the host can not be determined until we obtain the development history of the larva.

### Genus CAULOXENUS Cope.

*Generic characters of female.*—Cephalothorax stout, separated from the trunk by a deep constriction, like the waist of a wasp; trunk a stout, sacklike, unsegmented ovoid; no posterior processes, genital process, abdomen, or anal laminae; egg strings ovoid, shorter than the trunk; second maxillae elongate, fused through their entire length, tapering toward the distal end, where they are furnished with a broad, disklike bulla; these maxillae are attached at about the center of the cephalothorax and are folded back against the head. Male, unknown.

*Type.*—*Cauloxenus stygius* Cope.

(*Cauloxenus*, *καυλὸς*, a stem, and *ξενὸς*, a guest.)

*Remarks.*—This genus contains but a single species which is parasitic on the blind fish, *Ambylopsis spelaeus* De Kay. Both the host and the parasite were obtained by Professor Cope from Wyandotte Cave. The parasite was fastened to the inner edge of the upper lip of the fish, where it had to hold its body rigidly, by means of its powerful second maxillae, at an angle with the fish's lip in order to keep itself from being eaten. Professor Cope has given in the American by a diagnosis and accompanied by three text figures. The generic characters just given have been taken largely from his diagnosis, and, of course, apply equally well to the species. Neither his description nor his figures give us any details of the appendages, and since the original specimens have been lost we are left with the above meager details. They appear sufficient, however, to guarantee the validity of the genus, and so it is retained with the hope that sometime other specimens may be obtained and the genus be more firmly established.

## Genus CLAVELLA Oken.

*Clavella* Oken, 1815.
*Schisturus* (part) Oken, 1815.
*Lernaeomyzon* Blainville, 1822.
*Clavella* Cuvier, 1830.
*Anchorella* Nordmann, 1832.—Krøyer, 1837. Not *Anchorella* Cuvier, 1830.

*Generic characters of female.*—Cephalothorax distinctly separated from the trunk, long, wormlike, and standing at an angle with the body axis, often in line with the second maxillae; trunk pear-shaped or ovoid, without posterior processes, abdomen, or anal laminae; an unpaired genital process often present, ventral to the anus and connecting with the semen receptacle.

First antennae three-jointed, arising from the ventral surface of the head between the second antennae and the proboscis; second antennae uniramose, turned inward toward each other across the frontal margin of the head, often meeting or even overlapping on the midline; first maxillae bipartite, with a palp; second maxillae entirely fused, usually very short, sometimes altogether lacking; maxillipeds stout, the terminal claw usually with an accessory claw on its inner margin.

*Generic characters of male.*—Cephalothorax and trunk folded together ventrally and fused into an unsegmented ovoid, in which there is no distinction of parts; no dorsal carapace or anal laminae; first antennae two-jointed; second antennae uniramose and three-jointed; first maxillae bipartite, without a palp; second maxillae and maxillipeds close to the mouth-tube and strongly uncinate; all the appendages pointing diagonally downward and forward.

*Type.*—*Clavella uncinata* (Müller).

(*Clavella*, the diminutive of *clava*, a club.)

*Remarks.*—In his Lehrbuch der Naturgeschichte (1815) Oken first proposed (p. 182) three genera for the Lernaeans, *Phyllina*, *Schisturus*, and *Lernaea*. Under the second name he included 15 species which had been previously included in the genus *Lernaea;* among these was Müller's *Lernaea uncinata*. But Rudolphi had used the name *Schisturus* in 1809 for a genus of worms, and perhaps Oken became aware of this. At all events he presented later in the same book (p. 357) a much better classification of the Lernaeans, which he divided into four genera, *Axine*, *Clavella*, *Pennella*, and *Lernaea*. For the second of these genera which was new to science he took as the type *Clavella uncinata*.

In 1822 Blainville, overlooking or neglecting Oken's work, established (p. 438) a new genus which he called *Lernaeomyzon*, and of which he also made Müller's *Lernaea uncinata* the type.

In 1830 Cuvier, in his Le Règne Animal, adopted Oken's genus *Clavella* (vol. 3, p. 258) and included in it Müller's two species *uncinata* and *clavata*. But he also established (p. 257) a new genus which he named *Anchorella*, and for which he gave the following diagnosis: "Ne se fixe aux ouïes que par une seule productio qui part du dessous du corps, et se derige en arrière." He made Ström's *Lernaea adunca* the type of this new genus, which, of course, he claimed to be generically distinct from Oken's *Clavella*.

Krøyer in his Naturhistorisk Tidsskrift (1837) shuffled these genera in a very arbitrary and reckless manner. Under the Lernaeoda (vol. 1, p. 193) he placed as the first genus, "1. *Anchorella* (Cuv., *Clavella* Oken, *Lernaeomyzon* Blainv.). Arter: *Anch. uncinata* Fabr. *Anch. lagenula* Guérin. *Anch. microcephala* Nordm."

As the seventh genus he placed "*Clavella* Oken, Arter: *Cl. hippoglossi* Cuv. *Cl.* ? *clavata* Mull." (p. 195). He added in a footnote on the same page, "This genus was not included by Blainville, probably in the belief that it was identical with *Anchorella*, because Müller's *L. uncinata*, which Cuvier referred to the genus *Clavella*, really belongs to *Anchorella*; but this is not the case with *Cl. hippoglossi*. Whether it may be with *L. clavata* I can not say definitely, since I have not seen it, and Müller's description is unsatisfactory." Krøyer thus made Oken's *Clavella* a synonym of Cuvier's *Anchorella*, and then later established it as a distinct genus. He took the type-species of *Clavella* and made it the type of *Anchorella*, while he established as a new type for *Clavella* Guérin's species *hippoglossi*. Milne Edwards and subsequent writers, until recently, have followed Krøyer's arrangement, wholly ignoring Cuvier's generic distinction as well as the genera of Blainville and Oken.

The *Lernaea adunca*, which Cuvier made the type of the genus *Anchorella*, was described and figured by Ström in 1762, but has never been seen by any subsequent observer. So far as can be determined from Ström's description and figures the species is identical with *uncinata*. If the two really are the same, *Anchorella* becomes a synonym of *Clavella*; if they are not identical, both genera are valid, but the genus *Anchorella* can not possibly include *uncinata* and its relatives, as has been the common usage.

*Synonyms.*—To this illegitimate genus *Anchorella* has been referred indiscriminately a heterogeneous collection of more than 50 species, among which we must recognize at least three new genera. These species furnish one of the most convincing proofs that could be given of the lax methods adopted in dealing with the Lernaeopods. There are 16 species which are mere names, having never been either described or figured, one the data with reference to which do not justify us in locating it anywhere, 7 which can be located with probability, but not certainty, and 18 which must be transferred to other genera. This leaves only 17 out of the original 52, and to them are added 9 others which are new to science.

*Anchorella carusi, characis, clava, crassa, elongata, lichiae, simplex subtilis,* and *tenuis* were simply named in Richiardi's "Catalogo sistematico dei Crostacei." Brian afterwards described (1906, p. 113) and figured (pl. 10, fig. 5) Richiardi's *characis,* so that it can be definitely located in the genus *Clavella,* where he placed it. He also mentioned the other species, but without describing or figuring them.

*Anchorella adunca* has been noted above.

The following four species were described and figured by Krøyer (1863), *Anchorella agilis* (p. 300, pl. 16, fig. 2); *A. angulata* (p. 293, pl. 15, fig. 3); *A. denticis* (p. 296, pl. 16, fig. 4); *A. pagelli* (p. 295, pl. 16, fig. 3). The last two appear in Brian's "Copepodi parassiti dei pesci d'Italia," but his additions to Krøyer's descriptions consist of a few details with reference to the maxillipeds.

We have no data on the mouth parts, the antennae, or the male of either of the four species. *A. agilis* has been found by several collectors off the coast of Greenland (see Stephensen, 1913, p. 339), but nothing has been added to Krøyer's meager description. The four probably belong to *Clavella,* but there can be no certainty until these additional data are forthcoming.

*Anchorella* (*Lernaea*) *anomala* was described and figured by Abildgaard (1794, p. 57, pl. 6, fig. 2), who of course placed it in the genus *Lernaea.* Milne Edwards said of it:

> Le *Lernea anomala* d'Abildgaard paraît appartenir aussi á ce genre [*Anchorella*], mais différerait de toutes les espèces précédentes par la longueur considérable de l'organe d'adhésion, et par l'existence d'un renflement en forme de nœud à l'extrémité antérieure du thorax (1840, p. 520).

But of course this is not enough to identify the species and it also must await further details.

*Anchorella appendiculata* and *A. appendiculosa* (Krøyer, 1863, pp. 305 and 306, pl. 16, figs. 6 and 7) were each founded on a single specimen and no others have ever been obtained. The details given are sufficient to show that these species do not belong to the present genus. The four posterior processes, the second antennae, and the maxillipeds show a greater affinity with *Brachiella* than with *Clavella*, and accordingly the species are transferred to that genus. Krøyer claimed to have found a male of *appendiculata*, but put a question mark after the sex. So far as can be determined from his figures and description this "male" was simply a piece of the skin of the host and was not even anything alive.

*Anchorella canthari* Heller (1865, p. 242, pl. 24, fig. 6) almost certainly belongs to the genus *Clavella*. Heller does not give very many details in his brief description, but the additional data and the excellent figures of T. and A. Scott (1913, p. 224, pl. 69, figs. 1 to 3) are sufficient to locate it accurately.

*Anchorella centrodonti* van Beneden (1870, p. 43) was figured (pl. 2, fig. 5), but not described, and as far as the figure shows, appears to be a synonym of *pagelli*.

*Anchorella dilatata* Krøyer (1863, p. 302, pl. 15, fig. 2) shows several exceptional characters, notably the biramose second antennae and the body lobes on either side of the abdomen. If the details be just as Krøyer has described them, it differs considerably from *Clavella*, but can not be established elsewhere on our present knowledge.

*Anchorella emarginata* Krøyer (1837, p. 287, pl. 3, fig. 7) is here referred to the new genus *Clavellisa* (see p. 694).

*Anchorella fallax* Heller (1865, p. 241, pl. 24, figs. 4 and 5) is here referred to the new genus *Clavellopsis* (see p. 687).

*Anchorella hostilis* Heller (1865, p. 243, pl. 24, fig. 7) is certainly not a *Clavella*, and probably belongs to the genus *Brachiella* (see p. 702), but the male is needed for positive determination.

*Anchorella intermedia* Quidor (1906, p. 29, pl. 3, figs. 37 to 44) has biramose second antennae and slender maxillipeds, not reinforced. The male also corresponds with that of the genus *Clavellodes* but differs markedly from a *Clavella* male. The species, therefore, should be placed in the new genus *Clavellodes* (see p. 690).

*Anchorella laciniata* Krøyer (1863, p. 308, pl. 16, fig. 18) is here referred to the new genus *Clavellopsis* (see p. 687).

*Anchorella lagenula* Guérin (1817, pl. 9, fig. 5) is a synonym for *C. uncinata*.

*Anchorella lizae* Krøyer (1863, p. 294, pl. 16, fig. 11) belongs to the genus *Naobranchia* (see p. 660).

*Clavella macrotrachelus* Brian (1906, p. 116, pl. 21, figs. 1 to 4) is not a *Clavella*, as is shown by the male, and is referred to the new genus *Clavellodes* (see p. 690).

*Anchorella microcephala* was named by Nordmann (1832, p. 107), but was never described or figured.

*Clavella obesa* Richiardi (1880, p. 152) was named but never described or figured. It probably belongs to the genus *Hatschekia* and not to *Clavella*.

*Anchorella ovalis* Krøyer (1837, p. 289, pl. 3, fig. 6) belongs to the new genus *Clavellisa* (see p. 696).

*Anchorella paradoxa* van Beneden (1851, p. 117, pl. 6, fig. 1) is here referred to the new genus *Clavellopsis* (see p. 687).

*Anchorella quadrata* Bassett-Smith (1896, p. 15, pl. 4, fig. 5) is probably a *Clavella* and is retained in that genus, although it is very meagerly described.

*Clavella robusta* Wilson (1912, p. 96, pl. 8, figs. 73 to 78) has biramose second antennae and short posterior processes similar to those of Krøyer's *Anchorella laciniata*. It can not, therefore, remain in the genus *Clavella*, but must be transferred to the new genus *Clavellopsis* (see p. 688).

*Anchorella rugosa* Krøyer (1837, p. 284, pl. 3, fig. 14) is not a *Clavella* and is made the type of the new genus *Clavellodes* (see p. 690).

*Anchorella sargi* Kurz (1877, p. 393, pl. 25, figs. 5, 6, 29, 51, 52) is also not a *Clavella*, and is transferred to the new genus *Clavellopsis* (see p. 687).

*Clavella sciaenae* Brian (1906, p. 119, pl. 10, fig. 2; pl. 20, figs. 13, 14) is probably identical with Heller's *Anchorella sciaenophila* as Brian suggests. The presence of four posterior processes and the details of the antennae and mouth parts indicate that it should be transferred to the genus *Brachiella*. Here also the male must finally decide where the species belongs.

*Anchorella sciaenophila* Heller (1865, p. 243, pl. 24, fig. 8) is here transferred to the genus *Brachiella*, as just stated (see p. 703).

*Anchorella scombri* Kurz (1877, p. 403, pl. 25, figs. 12, 35, 41) is not a *Clavella* and is referred to the new genus *Clavellisa* (see p. 694).

*Anchorella stellata* Krøyer (1838, p. 142, pl. 3, fig. 5) is probably a *Clavella*, and may be left there until further data can be obtained.

*Clavella strumosa* Brian (1906, p. 112, pl. 9, figs. 4 to 7) is not a *Clavella* and is referred to the new genus *Clavellopsis* (see p. 687).

*Anchorella triglae* Kurz (1877, p. 404, pl. 35, figs. 13 to 15) was first described by Claus as a *Brachiella* (see p. 702), and was transferred by Kurz to *Anchorella*. The male shows conclusively that it belongs where Claus placed it.

*Anchorella urolophi* Krøyer (1863, p. 304, pl. 16, fig. 10) also presents marked exceptions to the *Clavella* characters. The second antennae are biramose, and there is a two-jointed abdomen with well-developed anal laminae. These furnish serious reasons for excluding it from the genus *Clavella*, but they do not tell us where it ought to be placed.

### TABLE OF SPECIES.

1. Cephalothorax definitely longer than the trunk.......... 2.

1. Cephalothorax about the same length as the trunk or shorter.......... 8.

2. Trunk as wide as, or wider than, long; base of neck somewhat differentiated from the rest of the thorax; second maxillae lacking, bulla on the body; egg strings long, tapering.......... 3.

2. Trunk as wide as, or wider than, long; base of neck not differentiated; second maxillae as long as the cephalothorax; egg strings short and stout.......... 4.

2. Trunk definitely longer than wide; base of neck not differentiated; second maxillae lacking, bulla on the body; egg strings long and tapering.......... 5.

3. Genital process exceptionally large and prominent; maxillipeds small; head pointed; egg strings straight.......... *perfida*, new species, p. 672.

3. Genital process medium-sized; maxillipeds small; head swollen and bluntly rounded; each egg string curled until its ends nearly touch each other. *characis* (Richiardi), 1880, p. 668.

4. Second maxillae completely fused; neck smooth; genital process large. *inversa* Wilson, 1912, p 673.

4. Second maxillae separate at their bases; neck and arms very rough; genital process minute.......... *pagri* (Krøyer), 1863.

4. Second maxillae separate at their tips; neck and arms smooth; genital process minute.......... *stichaei* (Krøyer), 1863.

5. Cephalothorax flexed back so tightly as to form a longitudinal groove on the dorsal body surface; head swollen; egg strings long and slender.......... 6.

5. Cephalothorax not turned back against the trunk; no dorsal groove; head not enlarged; egg strings short and stout.......... 7.

6. Second maxillae entirely lacking; trunk pear-shaped, much narrowed and wrinkled anteriorly; genital process minute.......... *agilis* (Krøyer), 1863, p. 668.

6. Second maxillae very short; trunk ovoid or ellipsoidal, smooth and plump; genital process minute.......... *bergyltae* (Krøyer), 1863.

6. Second maxillae entirely lacking; trunk oblong, no wrinkles; genital process one-third the length of the trunk.......... *tumida*, new species, p. 674.

6. Second maxillae one-third the length of the cephalothorax; trunk ovoid, not wrinkled; genital process of medium size..... *canaliculata*, new species, p. 675.

7. Second maxillae entirely lacking; cephalothorax stout and wrinkled posteriorly; genital process of medium size.......... *parva* Wilson, 1912, p. 676.

7. Second maxillae entirely lacking; trunk nearly spherical; genital process minute. *canthari* (Heller), 1865, p. 669.

7. Second maxillae quarter as long as cephalothorax; trunk ellipsoidal, twice as long as wide; genital process wanting.......... *insolita*, new species, p. 676.

7. Second maxillae half as long as cephalothorax; trunk ovoid, nearly three times as long as wide; genital process wanting.......... *levis*, new species, p. 677.

8. Genital process lacking; second maxillae medium length.......... 9.

8. Genital process present; second maxillae short, often lacking.......... 11.

9. Trunk as wide as, or wider than, long; second maxillae partly or wholly separated.......... *angulata* (Krøyer), 1863, p. 668.

9. Trunk distinctly longer than wide; second maxillae completely fused for their entire length.......... 10.

10. Trunk ellipsoidal, twice as long as wide, and evenly rounded; bulla a large flattened disk with stellate perforations.......... *stellata* (Krøyer), 1838, p. 670.

10. Trunk ellipsoidal, twice as long as wide, and evenly rounded; bulla minute and spherical.......... *pinguis*, new species, p. 678.

10. Trunk pear-shaped, three times as long as wide; second maxillae covered with scales.......... *squamigera*, new species, p. 679.

11. Cephalothorax thick and stout; trunk nearly as wide as, or wider than, long. 12.
11. Cephalothorax slender and linear; trunk considerably longer than wide...... 13.
12. Genital process of extraordinary size, fully as large as one of the egg strings. *quadrata* (Bassett-Smith), 1896.
12. Genital process one-quarter the length of the trunk; second maxillae completely fused; egg strings one-third longer than the trunk. *uncinata* (Müller), 1776, p. 680.
12. Genital process a mere ridge, scarcely projecting; second maxillae completely fused; egg strings shorter than the trunk............*recta*, new species, p. 684.
12. Genital process one-eighth the length of the trunk; second maxillae separate, the base of each surrounded by a large wing................*alata* Brian, 1906.
12. Genital process one-eighth the length of the trunk; second maxillae entirely fused, without wings; head pointed forward, parallel with trunk axis. *brevicollis* (M. Edwards), 1840.
13. Trunk ellipsoidal, smoothly rounded posteriorly; bulla an elongate club; egg strings narrow and tapered posteriorly................*pagelli* (Krøyer), 1863.
13. Trunk ellipsoidal, flattened, with a fleur-de-lis on the ventral posterior margin; egg strings narrow and cylindrical.................*irina*, new species, p. 685.
13. Trunk ovoid, narrowed anteriorly, truncated posteriorly; egg strings thick ellipsoids........................................*denticis* (Krøyer), 1863.
13. Trunk ellipsoidal, smoothly rounded posteriorly; bulla a sphere; egg strings long cylinders...............................*dubia* (T. and A. Scott), 1913.

### CLAVELLA PERFIDA, new species.

Plate 45, figs. 140 to 143.

*Host and record of specimens.*—An adult female with egg strings, and one attached male, and a young female with four attached males were obtained from the gills of an Alaskan pollack, *Theragra chalcogramma*, September 27, 1906, from a depth of 52 fathoms in the northwest Pacific. The adult specimen is made the type of the species and numbered 43505, U.S.N.M. The younger female, with the attached males, is numbered 43589, U.S.N.M.

*Specific characters of female.*—Cephalothorax much swollen and inflated, longer than the trunk and tapering gradually from the base to the tip, bent back dorsally against the trunk; head not enlarged, narrowed anteriorly; no dorsal carapace; base of neck with one or two constrictions, as though segmented; trunk much wider than long, convex ventrally, concave dorsally; genital process relatively large and prominent, on a level with the ventral surface; egg strings half as long again as the trunk, tapering slightly posteriorly; eggs arranged in 12 to 14 longitudinal rows, about 25 eggs in each row.

First antennae indistinctly three-jointed, wholly inside the second pair, tipped with a tuft of small setae; second antennae uniramose, the terminal joints bent across the frontal margin and almost touching at the midline; mouth tube reaching the posterior margin of these antennae, broad and stocky; first maxillae tripartite, with a small and poorly developed palp; second maxillae entirely lacking, the attachment bulla being fastened to the surface of the trunk at the base of the neck; opposite this bulla are the maxillary glands in the form of a club-shaped projection on either side, pointing diagonally outward and ventrally; maxillipeds with a triangular basal joint and a long and stout terminal claw, bent abruptly near the tip and armed there on the inner margin with an accessory spine.

Color (preserved material), a uniform yellowish-white.

Cephalothorax, 2.75 mm. long, 1 mm. wide. Trunk, 1.75 mm. long, including the genital process, 2.1 mm. wide. Egg strings, 3 mm. long.

*Specific characters of male.*—General body form, egg-shaped, quite pointed at the smaller end and evenly rounded at the larger end; first antennae two-jointed, well supplied with setae; second antennae indistinctly three-jointed, with two short setae at the tip; these antennae reach about to the center of the mouth tube, which is broad at the base, proportionally long, and inclined at an angle of 45° with the body axis; first maxillae bipartite at the tip, with a third ramus on the inner margin; second maxillae and maxillipeds of the usual pattern. Just behind the second maxillae a drop of the cement substance, which forms the covering of the spermatophores, has exuded from the genital orifice and hardened in the preservative.

Color (preserved material), a uniform yellowish-white.

Total length, including the mouth tube, 0.57 mm. Width, 0.33 mm.

(*perfidus*, deceitful, alluding to the apparent segmentation at the base of the neck, the external maxillary glands, and the apparent genital process on the male.)

*Remarks.*—The first two of the peculiarities just mentioned will serve to distinguish this species from all others of the genus, and as the Alaska fish become better known this parasite is likely to be found more abundantly.

### CLAVELLA INVERSA Wilson.

*Clavella inversa* WILSON, 1913, p. 231, pl. 50.

*Host and record of specimens.*—Six females with egg strings were obtained from the gills of the red-mouthed grunt, *Bathystoma rimator* July 18, 1910, at Montego Bay, Jamaica. The type-specimen was numbered 43513, U.S.N.M., while the paratypes were numbered 42291, U.S.N.M. A single adult female was taken by Dr. Edwin Linton from the gills of a croaker, *Micropodon undulatus*, at Beaufort, N. C., August 20, 1902. It is numbered 39610, U.S.N.M.

*Remarks.*—The host of this species is abundant along the Atlantic coast of the Southern States, particularly the Carolinas, where it is one of the common food fishes. Probably, therefore, an examination of these fishes in the markets or elsewhere would reveal a greater number of the parasites. The species may be recognized by the genital process, and by the distinctly undersized appearance of the body and egg strings when compared with the second maxillae and cephalothorax.

### CLAVELLA TUMIDA, new species.

Plate 45, figs. 144 to 147; plate 46, fig. 148.

*Host and record of specimens.*—A single female without egg strings, but with two attached males, was obtained from the gills of the tomcod, *Microgadus tomcod* at Harpswell, on the Maine coast, July 17, 1903. It of course becomes the type of the new species, and is numbered 39592, U.S.N.M.

*Specific characters of female.*—Cephalothorax swollen, slightly flattened dorso-ventrally, and flexed back against the dorsal surface of the trunk so tightly that it makes a groove along the median line of the latter. On either side of this groove the body rises into a ridge, which apparently increases the depth of the groove; head considerably swollen, and covered with a distinct dorsal carapace; trunk flattened dorso-ventrally, oblong, with rounded corners; ventral surface flat, with a well-defined central ridge of longitudinal muscles; dorsal surface with the two lateral ridges and the central groove as just stated; genital process relatively large, club-shaped, and attached on a level with the ventral surface. First antennae indistinctly three-jointed, the basal joint considerably swollen and attached a long distance inside of the second antennae and close to the mouth tube. Second antennae uniramose, the basal joints much enlarged and stiffened with a chitin framework, the terminal joints turned inward at right angles across the frontal margin and almost touching at the midline. Mouth tube short, narrow at the base and tip, and swollen through the center; first maxillae tripartite at the tip, the outer ramus very rudimentary; palp also small and armed with a single seta. Second maxillae practically wanting, only forming a bowl-shaped depression in the base of the neck; bulla of medium size, and spherical, fastened to the bottom of the bowl by a short pedicel; maxillipeds small, with a swollen basal joint and a slender terminal claw, bent sharply close to the tip, and armed there on the inner margin with an accessory spine.

Cephalothorax, 3 mm. long, 0.5 wide. Trunk, 2.5 mm. long, 1.25 mm. wide. Genital process, 0.6 mm. long.

*Specific characters of the male.*—Body somewhat egg-shaped, but considerably straightened along the ventral margin; mouth tube at the small end and projecting downward and forward at an angle of 45° with the body axis; the two pairs of antennae removed a long distance from the anterior margin and close together; first pair three-jointed, the third joint very narrow and more like a swollen seta; second pair with a short basal joint and one-jointed rami, the exopod slightly longer than the endopod and both armed with minute spines;

mouth tube more than twice as long as the second antennae and very broad at the base; first maxillae bipartite and slender, without a palp; second maxillae much longer than the maxillipeds and rather slender, armed with fleshy blunt processes rather than with claws; maxillipeds with a swollen basal joint and a small and curved terminal claw, whose tip fits into a pocket on the basal joint.

Color (preserved material), a uniform grayish-yellow.

Total length, 0.39 mm. Greatest width, 0.30 mm.

(*tumidus*, swollen, applying to the head and genital process of the female and the maxillipeds of the male.)

*Remarks.*—This species is rare, for out of an examination of more than 100 fish the type-specimen was the only one obtained.

It may be distinguished by its general swollen appearance, by the reentrant frontal margin of the head, and by the large genital process.

### CLAVELLA CANALICULATA, new species.

Plate 46, figs. 149 to 151.

*Host and record of specimens.*—A single female with egg strings and an attached male was obtained from the pectoral fin of the California tomcod, *Microgadus proximus*, at Yakutsk Bay, Alaska.

It becomes the type of the new species, and has received the number 39601, U.S.N.M.

*Specific characters of female.*—Cephalothorax slender, cylindrical, considerably longer than the trunk, and turned back against the dorsal surface of the latter; head and adjacent portion of the neck enlarged and squarely truncated anteriorly; no dorsal carapace; trunk elongate-ovate, somewhat flattened dorso-ventrally with a deep groove on the dorsal surface into which the cephalothorax fits, and a groove near the posterior end on either side, out of the bottom of which the oviduct opens; genital process of medium size, and inclined outward and backward; egg strings about the same length as the trunk and tapered posteriorly; eggs arranged in 8 longitudinal rows, about 20 eggs in a row.

Second antennae uniramose, the terminal joints turned down across the frontal margin and meeting at the midline; second maxillae in line with the cephalothorax, about one-quarter the length of the latter, fused into a common cylinder for their entire length and somewhat enlarged at the tip; bulla spherical and almost sessile; maxillipeds placed far forward and covering the mouth tube, first antennae and first maxillae, basal joint stout, terminal claw slender, with an accessory claw on the inner margin near the tip.

Cephalothorax 3 mm. long, 0.45 mm. wide. Trunk 2.5 mm. long, 1.5 mm. wide, 1 mm. thick. Egg strings 2.55 mm. long, 0.625 mm. wide.

*Specific characters of male.*—Body egg-shaped, quite pointed anteriorly, no dorsal carapace; first antennae with a rudimentary endopod and indistinctly jointed; endopod of second antennae also rudimentary, exopod ending in two setae; mouth tube pointing forward in line with the body axis and about twice the length of the first antennae; first maxillae bipartite at the tip and without a palp; second maxillae long and narrow, contrasting strongly with the short and stocky maxillipeds.

Color (preserved material), yellowish-white.

Total length, 0.45 mm. Greatest width, 0.30 mm.

(*canaliculatus*, grooved, alluding to the large groove down the center of the back, into which the cephalothorax fits.)

*Remarks.*—The first antennae are partially, and the first maxillae are entirely, hidden by the maxillipeds in the female, and it was not considered advisable to mutilate the type-specimen for the sake of getting at the first maxillae. The species is sufficiently distinguished by the deep dorsal groove and the wide and inclined genital process of the female.

### CLAVELLA PARVA Wilson.

*Clavella parva* WILSON, 1912, p. 95, pl. 8, figs. 66 to 72.

*Host and record of specimens.*—Ten females with egg strings were obtained from the soft dorsal fin of the brown rockfish, *Sebastodes auriculatus*, at Nanaimo, British Columbia. Six of the specimens were selected as types of the species and numbered 39525, U.S.N.M.

*Remarks.*—This species may be distinguished by its minute size, and by the form of the first maxillae, which are bipartite at the tip, each ramus ending in two setae, with a fifth seta on the outer margin; palp short and ending in two setae.

### CLAVELLA INSOLITA, new species.

Plate 46, figs. 152 and 153.

*Host and record of specimens.*—Two females with egg strings were obtained from the pectoral fin of *Leptoblennius serpentinus*, the snake blenny, at Woods Hole, Massachusetts, dredged from a depth of 41 fathoms. The largest female is made the species type and is numbered 39607, U.S.N.M.

*Specific characters of female.*—Cephalothorax in line with the second maxillae, slender, cylindrical, slightly swollen at the base and smooth; head not enlarged, squarely truncated anteriorly, and without a dorsal carapace; trunk ellipsoidal, one-third shorter than the cephalothorax, with a row of shallow transverse wrinkles along either side of the midline on the ventral surface; genital process partially separated inside the skin but not showing externally; egg strings ellipsoidal, a little shorter than the trunk; eggs large, arranged in

8 longitudinal rows, about 10 or 12 eggs in a row. First antennae slender, indistinctly three-jointed, much swollen at the base, narrow at the tip, with but one or two setae; second antennae uniramose, with a slender, conical terminal joint, and a stout basal portion, reinforced with chitin ribs; mouth tube broad, but not projecting beyond the first maxillae; the latter bipartite at the tip, with a minute palp, bearing a single seta; second maxillae short, stout, and thoroughly fused for their entire length; bulla minute and spherical; maxillipeds with a long and fairly stout basal joint and a slender terminal claw, without spines or accessory claws; these maxillae are removed behind the mouth tube so that they do not overlap the other mouth parts.

Color (preserved material), dark cinnamon brown; egg strings red. Total length, excluding egg strings, 4.5 mm. Length of cephalothorax and second maxillae, 3 mm. Width, 0.5 mm. Trunk, 2.1 mm. long, 0.9 mm. wide. Egg strings, 1.6 mm. long; 0.5 mm. wide.

(*insolita*, unusual, alluding to the absorption of the genital process into the trunk.)

*Male.*—Unknown.

*Remarks.*—The host of this parasite is very rare as far south as Cape Cod, which would account for the limited number of specimens and the fact that it has never been discovered before.

### CLAVELLA LEVIS, new species.

Plate 47, figs. 154 and 155.

*Host and record of specimens.*—Two females without egg strings were obtained from the pectoral fins of a "rare Brotulid" by the steamer *Blake* of the United States Coast Survey. The better of the two is made the species type with the number 43553, U.S.N.M. The other becomes a paratype, with the number originally given it, 6086, U.S.N.M.

*Specific characters of female.*—Cephalothorax slender and cylindrical, a little longer than the trunk; head not enlarged, pointed anteriorly, without a dorsal carapace; second maxillae in line with the cephalothorax and about half as long; trunk egg-shaped, about twice as long as wide and perfectly smooth, without ridges or processes of any kind. First antennae with the basal joint strongly swollen, the two terminal joints cylindrical, bent at an angle with the basal joint and tipped with two spines; second antennae uniramose, the joints diminishing rapidly in size from the base toward the tip. These antennae are not bent across the frontal margin as is usual, but are turned ventrally, the last joint bent inward and tipped with a tuft of setae. Mouth tube broadly conical, projecting a little beyond the anterior margin; first maxillae bipartite, with a small palp armed with a single seta; second maxillae fused entirely, but with the line of demarcation plainly visible; bulla relatively large and shaped like a wine glass; maxillipeds with a triangular basal joint and a slender curved terminal claw, with an accessory claw on its inner margin near the center.

Color (preserved material), a rich reddish-brown.

Cephalothorax, 3.5 mm. long, 0.5 mm. wide. Trunk, 3 mm. long, 1.35 mm. wide. Second maxillae, 1.25 mm. long.

(*levis*, smooth, alluding particularly to the absence of all ridges and processes at the posterior end of the trunk.)

*Male.*—Unknown.

*Remarks.*—The Brotulid hosts are not obtained often enough to tell how common these parasites may be on them. The species may be recognized by the smoothness of the posterior end of the trunk and by the peculiar form of the first and second antennae. The direction of the latter appendages ventrally instead of across the anterior margin is peculiar and is readily seen in a ventral view of the head.

### CLAVELLA PINGUIS, new species.

Plate 47, figs. 156 to 161.

*Host and record of specimens.*—Fifteen females with egg strings and two males were obtained from the pectoral fins of "*Lycodes brunneus*" off the coast of New Jersey in the deep Atlantic. One female has been selected as the type of the new species and numbered 43594, U.S.N.M. The other specimens become paratypes and are numbered 8352, U.S.N.M. A second lot was obtained from the pectoral fins of "*Lycodes*, brown sp.," taken in the deep Atlantic close to the previous lot. There are three females, one very young and only 1.5 mm. in length; they are numbered 8351, U.S.N.M.

A third lot, containing ten females, was obtained from the pectoral fins of *Lycodes frigidus*, caught in the deep water off the coast of Nova Scotia. They are numbered 39606, U.S.N.M.

A fourth lot of two females was obtained from the same host off Nantucket Island and are numbered 43587, U.S.N.M.

A single female was obtained from the pectoral fin of a species of *Macrurus* in the deep water south of Buzzards Bay, Rhode Island. It is numbered 6074, U.S.N.M.

*Specific characters of female.*—Cephalothorax slender, cylindrical, and slightly longer than the trunk; head not enlarged nor differentiated from the neck; no dorsal carapace; trunk elliptical in outline, flattened dorso-ventrally, much longer than wide, without a genital process; external oviduct openings with deep grooves on both the dorsal and ventral surfaces; egg strings cylindrical, about the same length as the trunk; eggs small, in 8 or 10 longitudinal rows, about 25 or 30 in a row.

First antennae short and very indistinctly jointed; second antennae uniramose, turned down across the frontal margin, with the tips meeting at the midline; mouth tube wide and with its tip overlapping the second antennae; first maxillae long and slender, tripartite, the outer ramus much shorter than the others; palp short and armed with a single seta; second maxillae short and completely fused, tapering rapidly toward the tip; bulla small and spherical; maxillipeds with a long basal joint and a slender terminal claw, curved at the tip and carrying an accessory claw on its inner margin.

Color (preserved material), a deep brownish-yellow, eggs orange.

Cephalothorax, 4 mm. long, 0.5 mm. wide. Trunk, 3.5 mm. long, 1.5 mm. wide, 1 mm. thick. Egg strings, 3.5 mm. long, 0.62 mm. thick.

*Specific characters of male.*—Body egg-shaped, widest posteriorly; mouth tube long and pointed forward in line with the body axis; first antennae removed some distance from the dorsal margin and apparently only two-jointed; second antennae with one-jointed rami, both of which are armed with short processes rather than with spines; first maxillae long and slender and bipartite, without a palp; second maxillae and maxillipeds of the usual form.

Color (preserved material), a grayish-yellow.

Total length, 0.4 mm. Greatest width, 0.25 mm.

(*pinguis*, smooth, sleek.)

*Young female.*—Cephalothorax folded back against the dorsal surface of the trunk and one-third longer than the latter; head considerably enlarged through the bases of the maxillipeds; second maxillae in line with the cephalothorax and one-third the length of the latter, from which they are separated by a well-defined groove; bulla spherical, on a long pedicel; trunk cylindrical, the same diameter throughout, and perfectly smooth, without grooves or processes.

*Remarks.*—This species seems fairly common on the deep water forms of *Lycodes*. It may be distinguished by the long and narrow trunk, the absence of a genital process, and the deep grooves at the bases of the egg strings.

### CLAVELLA SQUAMIGERA, new species.

Plate 48, figs. 162 to 166.

*Host and record of specimens.*—An adult female without egg strings was obtained from the tail fin of *Antimora viola*, August 5, 1884, in the deep water of the Atlantic opposite Atlantic City, New Jersey.

The cephalothorax of a second specimen was also obtained, but the trunk in some way was destroyed. The perfect specimen is made the species type and is numbered 39602, U.S.N.M.

trunk and very slender; head not enlarged but tapered strongly anteriorly; no dorsal carapace; trunk pear-shaped, somewhat flattened dorso-ventrally, narrowed into a short neck anteriorly where it joins the cephalothorax, and with two posterior knobs, one at the mouth of each oviduct; no genital process.

First antennae pointing ventrally and apparently two-jointed, the terminal joint very small and tipped with three setae; second antennae uniramose, three-jointed, the two terminal joints turned down across the frontal margin and tapered to a point. The anterior margin of the head is so narrow and these antennae are so long that they overlap considerably at the midline. Mouth tube a broad cone, so short that it reaches only halfway to the second antennae; first maxillae bipartite at the tip, with a rudimentary palp, tipped with a single seta; second maxillae fused for their entire length, but with the line of demarcation plainly visible. Each maxilla is considerably swollen and bears at the tip and on the sides chitin scales, which point backward, away from the tip, and overlap one another like shingles. Bulla small, dark-colored, and club-shaped; maxillipeds with a narrow and elongate basal joint and a medium terminal claw, reenforced with an accessory spine on the inner margin near the center.

Cephalothorax, 6 mm. long, 0.4 mm. wide. Trunk, 4.66 mm. long, 2 mm. wide, 1 mm. thick.

(*squamigera, squama*, a scale, and *gero*, to bear, alluding to the remarkable scales on the second maxillae.)

*Remarks.*—This species can be recognized at once by the scales on the second maxillae, since nothing like them has been reported from any other species. They seem to increase both in size and in number with the age of the parasite. They bear some resemblance to the anchoring apparatus found on the heads of some of the *Lernaeidae*. But in the present instance they do not even touch the skin of the host, to say nothing of being buried in its flesh, since there is a normally functioning bulla at the tips of these maxillae. Their use is decidedly problematical.

### CLAVELLA UNCINATA (Müller).

Plate 27, fig. M; plate 48, figs. 167 to 173; plate 49, figs. 174 to 176.

*Lernaea uncinata* Müller, 1776, p. 38, pl. 33, fig. 2.
*Schisturus uncinatus* Oken, 1815, p. 183.
*Clavella uncinata* Oken, 1815, p. 358.
*Lernaeomyzon uncinata* Blainville, 1822, p. 438.
*Clavella uncinata* Cuvier (Oken), 1830, p. 258.
*Ancorella uncinata* Nordmann, 1832, p. 102.
*Anchorella uncinata* Krøyer, 1837, p. 193, pl. 3, fig. 8, *a* to *f*.

*Host and record of specimens.*—The following list gives the hosts, localities, specimens, and numbers of the large collection of this species in the National Museum:

| Cat. No. | Males. | Females. | Host. | Locality. |
|---|---|---|---|---|
| (1427) | .......... | 15 | Cod's fins | Woods Hole, Massachusetts. |
| (1445) | .......... | 10 | Cod's gills. | Woods Hole, Massachusetts. |
| (1467) | .......... | 5 | Cod's gills. | Woods Hole, Massachusetts. |
| (1508) | .......... | 5 | Cod's gills. | Woods Hole, Massachusetts. |
| (1992) | .......... | 6 | Cod's gills. | Commander Islands. |
|  | .......... | 2 | Cod's gills. | Sta. 2518, Steamer *Albatross*. |
| 6118 | .......... | 4 | Cod's gills. | Georges Banks. |
| 7990 | 30 | 25 | Cod's gills. | Marthas Vineyard. |
| 7991 | .......... | 1 | Cod's gills. | Commander Islands. |
| 7993 | .......... | 3 | Cod's gills | Harpswell, Maine. |
| 7994 | .......... | 1 | Cod's gills | Harpswell, Maine. |
| 7995 | .......... | 2 | Cod's gills | Harpswell, Maine. |
| 7996 | .......... | 3 | Cod's gills. | Harpswell, Maine. |
| 7997 | .......... | 2 | Cod's gills. | Casco Bay, Maine. |
| 7998 | .......... | 4 | Cod's gills | Cornwall, England. |
| 8347 | .......... | 20 | Cod's gills | Coxs Ledge, Maine. |
| 19893 | .......... | 30 | Cod's gills. | Woods Hole, Massachusetts. |
| 20008 | .......... | 25 | Cod's gills. | Woods Hole, Massachusetts. |
| 39568 | .......... | 15 | Cod's fins | Woods Hole, Massachusetts. |
| 39569 | .......... | 4 | *Gadus macrocephalus* | Chignik Bay, Alaska. |
| 39572 | .......... | 8 | Pollack's gills | Casco Bay, Maine. |
| 39584 | .......... | 10 | Pollack's gills | Casco Bay, Maine. |
| 39586 | .......... | 3 | *Pollachium carbonarium* | Gloucester, Massachusetts. |
| 39590 | .......... | 10 | No host | No locality. |
| 39593 | .......... | 2 | Cod's mouth | Woods Hole, Massachusetts. |
| 39598 | .......... | 5 | Rock cod's gills | Harpswell, Maine. |
| 39600 | .......... | 5 | Cod's fins | Woods Hole, Massachusetts. |
| 39605 | .......... | 6 | Cod's gills | Brunswick, Maine. |
| 39609 | .......... | 3 | Cod's gills | Harpswell, Maine. |
| 39623 | .......... | 1 | Cod's mouth | Steamer *Albatross*. |
| 42305 | .......... | 3 | Cod's fins | Casco Bay, Maine. |
| 42330 | .......... | 1 | No host | No locality. |
| 42334 | 2 | 3 | Cod's gills | WoodsHole, Massachusetts. |
| 43515 | .......... | 5 | *Gadus macrocephalus* | Atka, Alaska. |
| 43516 | 5 | 25 | Cod's gills. | Casco Bay, Maine. |

Lot No. 7990 was remarkable for the fact that nearly every female had at least one attached male and a few had as many as three or four, usually fastened to the sexual process, sometimes to the neck, and in one instance to the egg string. The specimens in the two lots from the Pacific cod are similar in all respects to those from the Atlantic, but average larger in size.

*Specific characters of female.*—Cephalothorax cylindrical, the same diameter throughout, and a little longer than the trunk; head not enlarged nor narrowed, but squarely truncated anteriorly; no dorsal carapace; cephalothorax in line with the second maxillae and both attached to the extreme anterior end of the trunk; the latter more or less quadrilateral, with rounded corners, flattened dorso-ventrally and somewhat reentrant at the center posteriorly; genital process on a level with the ventral surface and minute; egg strings cylindrical slightly tapering posteriorly, and varying from one to two and a half times the length of the trunk; eggs arranged in 10 or 12 longitudinal rows, from 15 to 35 in a row.

First antennae indistinctly three-jointed, tipped with two short setae, and close to the base of the mouth tube; second antennae uniramose, the basal joints lying along the sides of the head and supported by strong chitin ribs, the terminal joints bent squarely across terior margins in contact with the anterior ends of the maxillipeds. These terminal joints are also strengthened by stout chitin ribs, and their bluntly rounded tips are roughened by short spines. Mouth tube very short and narrow, actually withdrawn behind the ends of the maxillipeds; mandibles with a slender neck, a widened blade, and five or six large, sharply pointed and curved teeth; first maxillae short and slender, bipartite, the palp extremely rudimentary.

Second maxillae short, thoroughly fused, and furnished with a medium-sized spherical bulla; maxillipeds pushed forward until they completely overlap the mouth tube, first antennae and maxillae. They are rather small with a stout basal joint and a slender, curved terminal claw, which is twisted so that it shuts down on the dorsal surface of the basal joint, and is wholly invisible in ventral view.

Color, a uniform orange yellow, lighter in living specimens, much deepened and darkened on preservation in alcohol, especially the chitin framework of the second antennae.

*Specific characters of male.*—General body form ovoid, the head at the pointed end; cephalothorax folded ventrally against the trunk and the two indistinguishably fused, with no recognition of parts, no segmentation, no anal laminae, and no dorsal carapace.

First antennae two-jointed and tipped with two minute setae; second antennae with a long, three-jointed exopod, tipped with two or three short setae, and a rudimentary endopod, unarmed; mouth tube large and long, conical, projecting its entire length in front of the thorax; mandibles similar to those of the female; first maxillae narrow and slender, bipartite, ending in two long acuminate setae, the palp with a single seta; second maxillae long and narrow, projecting some distance beyond the maxillipeds, and armed with a short and slender claw; maxillipeds with a stout, triangular basal joint and a short and stout claw; the surface of the basal joint on the inner surface is raised up in a semicircular ridge, which forms a sheath, into which the tip of the claw fits when it is closed; between the maxillipeds on the median line is a short rounded process, similar to that noted by van Beneden in the male of *Brachiella*, and by Kane in the male of *Lernaeopoda*.

Color, a uniform yellowish-white.

Total length, 0.5 mm. Greatest width, 0.32 mm.

(*uncinata*, furnished with claws, alluding to the maxillipeds which had not been found on other Lernaeans).

*Copepodid larva.*—A single finely preserved specimen was found among a lot of adult males and females taken from the gills of a flounder. General body form similar to that of *Cyclops;* carapace a fusion of the first thorax segment with the head, ovate in shape, three-fifths of the entire length, with the anterior and posterior mar-shorter than the second and fourth (fig. 13, p. 593).

First antennae attached to the anterior corners of the carapace on the dorsal surface, three-jointed, the terminal joint as long as the basal ones. These antennae are turned back and approximated close to the sides of the carapace; the basal joint is armed with a single small spine, the terminal joint ends in a tuft of six spines, unequal in length. The second antennae project diagonally forward from beneath the bases of the first pair; they are two-jointed, the terminal joint being a stout acuminate claw, bent into a half circle and armed at its base on the ventral surface with a short spine. The mouth tube is cylindrical, of the same diameter throughout, and bluntly rounded at the tip. The mandibles are included in the tube and reach to its tip; they are slender, slightly enlarged at both ends, and furnished with a dozen small saw teeth, all about the same size.

Inside the base of the mandibles can be seen the tips of the new pair which are to appear at the next molt.

The first maxillae are attached to the ventral surface of the head, outside of and close to the base of the mouth tube. Each is composed of two rami of the same length, the exopod being stout and conical and ending in a single spine, the endopod slender and cylindrical and ending in two long equal spines (fig. 14, p. 594).

The second maxillae are two-jointed, the basal joint longer and stouter than the terminal joint; they end in a blunt claw which is bent strongly near the base. The maxillipeds are longer and more slender than the second maxillae, the basal joint much stouter than the terminal; the latter ends in a slender, acuminate claw, only slightly bent, with a small spine on the ventral surface at its base. Both pairs of legs are biramose, the rami one-jointed; the basal joints carry a long threadlike spine on the outer margin; the exopods are armed with two long and two short spines on the outer margin, the latter fringed with fine teeth, and four plumose setae at the tip; the endopods have a single small spine at the outer distal corner and six plumose setae, one of which is removed from the other five and appears on the inner margin close to the base.

*Remarks.*—This is the oldest species, and therefore an appropriate type of the genus. Its history has already been given under the genus remarks (see p. 667). It is so common that it has been at least mentioned by almost everyone who has dealt with the parasitic copepods. And yet it is surprising to find that it has never been described in any detail, while the best figures that have been published are either too small to show the detail (Krøyer, 1837), are taken at such an angle as to give a poor idea of the real structure (Vogt, 1877), or are buried in a general treatise (Claus, 1861) whence it is difficult to extract those that belong to any definite species. The same is found to be true of the male; Vogt copied Nordmann's and Krøyer's figures which gave incorrect details, and in the enlarged figure which he himself added (1877, pl. 4, fig. 4) he made some serious blunders which have remained uncorrected up to the present time. This is the only detailed figure of the male which has ever been published, and yet in it the "first antenna" has no real existence, the "second antenna" is really the first one, and the "palp" is the second antenna, while he failed to see the first maxillae at all. He did see them in his figure of the mouth parts of the female (fig. 7), but he called them there the "palp," which would make them correspond in his judgment with the second antennae of the male.

### CLAVELLA RECTA, new species.

Plate 50, figs. 183 and 184.

*Host and record of specimens.*—Seven females with egg strings were obtained from the dorsal and caudal fins of *Sebastodes melanops*, locally known as "black bass," at Sitka, Alaska, July 28, 1903.

The largest and best preserved specimen has been selected as the type of the species and has received the number 43519, U.S.N.M. The others become paratypes, with the number 38593, U.S.N.M.

*Specific characters of female.*—Cephalothorax thick, cylindrical, somewhat longer than the trunk; head not enlarged, nor covered with a dorsal carapace, but pointed anteriorly; trunk subquadrilateral in outline, with rounded corners and convex dorsal and ventral surfaces; genital process a ridge or lump not projecting much, bordered by a similar ridge on either side, the two side ones meeting at a point in front of (ventral to) the median one; egg strings ellipsoidal, about the length of the trunk; eggs arranged in 10 or 12 longitudinal rows, about 15 eggs in each row.

First antennae indistinctly three-jointed and sparsely armed with setae; second antennae uniramose and straight, not bent across the frontal margin. The antennae themselves taper strongly toward the tip and the lateral margins of the head approach each other anteriorly, so that the ends of these antennae almost meet on the midline, but there is no bend in them.

First maxillae bipartite, with a simple palp armed with a single seta; second maxillae very short, entirely fused, but with the line of demarcation clearly indicated; they are not in line with the cephalothorax but are parallel with the trunk axis; bulla minute, spherical, dark-colored; maxillipeds with a rather long basal joint and a slender terminal claw, which is reinforced by an accessory claw on its inner margin near the tip. These maxillipeds are relatively small and are pressed closely to the ventral surface of the head, so that it is difficult to distinguish them, even in a side view.

*Male.*—Unknown.

Color (preserved material), a uniform grayish-yellow. Cephalothorax, 3 mm. long, 0.5 mm. wide. Trunk, 2.25 mm. long, 2 mm. wide. Egg strings, 2 mm. long, 0.90 mm. wide.

(*rectus*, straight, alluding to the second antennae.)

*Remarks.*—The pointed head, the straight second antennae, and the tiny maxillipeds serve to distinguish this species from those previously described. It adds one more to those obtained on fish from the Pacific coast.

### CLAVELLA IRINA, new species.

Plate 49, figs. 177 to 181.

*Host and record of specimens.*—Two adult females with egg strings and an attached male were taken from the gill cavity of the Pacific cod, *Gadus macrocephalus*, at Chignik Bay, Alaska, August 7, 1903, by Dr. Harold Heath. The more perfect one is made the type of the species and is numbered 43568, U.S.N.M. The other female becomes a paratype and is numbered 39570, U.S.N.M.

*Specific characters of female.*—Cephalothorax slender and cylindrical, the same diameter throughout and longer than the trunk; no dorsal carapace; trunk oblong, flattened dorso-ventrally, with rounded corners; genital process on a level with the ventral surface, ellipsoidal, flanked on either side at its base with a curved process, the three together forming a conventional fleur-de-lis; egg strings cylindrical, tapering posteriorly, the same length as the trunk; eggs in 6 longitudinal rows, about 40 in a row.

First antennae indistinctly three-jointed, thick at the base and tapering, with three short terminal setae; second antennae uniramose, with a long and stout basal joint and a short terminal joint bent across the anterior margin, but not at a right angle.

The tips of these antennae do not quite meet on the midline and are roughened with minute spines. Mouth tube relatively much larger than in *uncinata*, and projecting beyond the second antennae; first maxillae bipartite, with a small palp bearing a single seta. Second maxillae not in line with the cephalothorax but parallel with the axis of the trunk, short, tapering, completely fused, but with the line of demarcation plainly visible; bulla small, club-shaped. Maxillipeds with a moderately swollen basal joint and a slender, curved terminal claw, carrying an accessory claw on its inner margin near the tip. These maxillipeds are close to the mouth tube as in *uncinata*, but they do not cover the mouth parts quite so completely.

Color (preserved material), a uniform yellowish-white.

Cephalothorax, 7 mm. long, 0.85 mm. wide. Trunk, 6.40 mm. long, 3 mm. wide, 2 mm. thick. Second maxillae, 1.6 mm. long. Egg strings, 8 mm. long.

*Specific characters of male.*—Body egg-shaped, more pointed anteriorly than that of *uncinata* and not as evenly rounded posteriorly, with the result that the thickest part of the egg comes, not through the bases of the second maxillae as in *uncinata*, but a considerable distance behind them; no dorsal carapace; mouth tube almost in line with the trunk axis and projecting its entire length in front of the anterior margin. First antennae three-jointed, with two terminal setae; second antennae with a long basal joint, a short exopod indistinctly jointed and tipped with two tiny spines, and a rudimentary endopod; first maxillae slender, bipartite, with a small palp carrying a single seta; second maxillae long and slender, with a small but powerful terminal claw; maxillipeds with a stout basal joint and a slender terminal claw, both appendages relatively smaller than in *uncinata*.

Color (preserved material), a dark yellowish-white.

(*irinus*, belonging to an iris flower, alluding to the fleur-de-lis pattern at the posterior end of the trunk.)

*Remarks.*—This species is quite different from *uncinata*, and may be recognized by its large size, by the fleur-de-lis pattern at the posterior end of the trunk and by the shape of the maxillipeds. It is evidently not a very common species.

## CLAVELLOPSIS, new genus.

*Generic characters of female.*—General body form short, thick, and squat; cephalothorax distinctly separated from the rest of the body but much shorter and thicker than in *Clavella;* trunk inflated, often wider than long; genital process present and sometimes posterior processes, but no abdomen or anal laminae.

First antennae four-jointed, situated as in *Clavella;* second antennae biramose, the endopod (dorsal) one-jointed, the exopod (ventral) distinctly two-jointed and often tipped with a spine or olfactory cylinder; first maxillae bipartite, the palp usually with two setae; second maxillae with broad and winglike folds of skin at the base of the pedicel of the bulla; maxillipeds stout, the terminal claw usually reinforced by an accessory claw.

*Generic characters of male.*—Cephalothorax and trunk at right angles, the latter a semiellipsoid, strongly arched dorsally and flattened ventrally, with no distinction of parts and no dorsal carapace. First antennae three-jointed; second antennae biramose, each ramus unsegmented; mouth tube extending ventrally at right angles to the long diameter of the ellipse; first maxillae tripartite, without a palp; maxillipeds at about the center of the ventral surface; second maxillae posterior to them and pointing somewhat backward; no anal laminae.

*Type.*—*Clavellopsis* (*Anchorella*) *laciniata* (Krøyer).

(*Clavellopsis*, *Clavella* and ὄψις, appearance, likeness.)

*Remarks.*—The species which go to make up this new genus have heretofore been referred to the genus *Clavella*. But although their outward appearance is like that of *Clavella* there are certain details of structure which do not allow them to be included in that genus. The chief points of distinction are to be found in the four-jointed, first antennae, the biramose second antennae, and the reinforced second maxillae of the female and in the general form of the male, together with the structure of the two pairs of antennae and the first maxillae.

### TABLE OF SPECIES.

1. Cephalothorax distinctly longer than the trunk.............................. 2.
1. Cephalothorax the same length as, or shorter than, the trunk.................. 4.
2. Six posterior processes present; second maxillae entirely lacking, bulla attached to the surface of the trunk; egg strings half the length of the trunk. *laciniata* (Krøyer), 1863, p. 687.
2. No posterior processes; second maxillae present.............................. 3.
3. Neck and second maxillae swollen and much wrinkled; genital process minute. *fallax* (Heller), 1865, p. 669.
3. Neck and second maxillae swollen but smooth; genital process cylindrical and one-third the length of the trunk; egg strings short and stout......*sargi* (Kurz), 1877.
4. Two to six posterior processes; cephalothorax and trunk thick and swollen..... 5.
4. No posterior processes; cephalothorax swollen only at the base................. 6.
5. Cephalothorax flexed forward; genital process minute. *robusta* (Wilson), 1912, p. 688.
5. Cephalothorax flexed backward; genital process large. . *paradoxa* (van Beneden), 1851.
6. Trunk spherical, flattened, nearly as wide as long; head with a dorsal carapace. *strumosa* (Brian), 1906.
6. Trunk cylindrical, flattened, six times as long as wide; no dorsal carapace. *producta*, new species, p. 688.

### CLAVELLOPSIS LACINIATA (Krøyer).

*Anchorella laciniata* Krøyer, 1863, p. 308, pl. 16, fig. 8, *a* and *b*.
*Clavella laciniata* Wilson, 1913, p. 259, pl. 49.

*Host and record of specimens.*—Five females and two males were found attached to the skin in the roof of the mouth of the doctor fish, *Teuthis hepatus*, at Montego Bay, Jamaica. They have received Cat. No. 42310, U.S.N.M.

*Remarks.*—The female of this species was briefly described by Krøyer in 1863, and was not seen again until the summer of 1910, when both sexes were obtained by the present author in Jamaica, and were fully described and figured in the reference given above.

The species was then referred to the genus *Clavella*, but further study compels its separation and establishment as a distinct genus. And since this is one of the oldest and best known species it is made the genus type (see pl. 27, fig. K).

### CLAVELLOPSIS ROBUSTA (Wilson).

Plate 49, fig. 182.

*Clavella robusta* Wilson, 1912, p. 96, pl. 8, figs. 73 to 78.

*Host and record of specimens.*—A single lot of six females with egg strings was taken from the gill cavity of the brown rockfish, *Sebastodes auriculatus*, at Nanaimo, British Columbia. The species types are in the collection of the National Museum and are numbered 39331, U.S.N.M.

*Remarks.*—This species was fully described and figured in the reference above given. It was then placed in the genus *Clavella*, but according to the new standards here established it must be transferred to the genus *Clavellopsis*, because its second antennae are biramose, with a two-jointed exopod, and there are very short posterior processes, similar to those in *laciniata*.

There is need of the male of this species before the systematic position can be finally determined.

### CLAVELLOPSIS PRODUCTA, new species.

Plate 50, figs. 185 and 186.

*Host and record of specimens.*—Two females without egg strings were obtained by the Bureau of Fisheries steamer *Albatross* from the anal fin of *Nematonurus goodei* (Günther), July 21, 1884, in the deep Atlantic opposite Chesapeake Bay. One of these was badly injured when obtained; the other is made the type of the new species and is numbered 43524, U.S.N.M.

*Specific characters of the female.*—Cephalothorax in line with the second maxillae, smooth, slender, and considerably shorter than the trunk; head not enlarged, pointed anteriorly; no dorsal carapace; trunk much elongated, slender, smooth, slightly enlarged at the posterior end and smoothly rounded without ridges or processes of any sort. First antennae indistinctly jointed, with an enlarged base; second antennae biramose, the exopod short, one-jointed, and bluntly rounded, the endopod longer, two-jointed, and tipped with a short conical spine; mouth-tube broadly conical, projecting in front of the anterior margin, but not as far as the second antennae; first maxillae bipartite, the palp small and armed with a single seta; second maxillae much swollen, transversely wrinkled, and fused throughout their length, but with the demarcation plainly visible; bulla small, black, and conical, with a broad, wing-like fold of skin around its base; maxillipeds with a rather stout basal joint and a slender claw, curved near the tip, and with a notch and tooth on its inner margin near the center.

Color (preserved material), a dark cinnamon brown.

Cephalothorax and second maxillae, 8.40 mm. long, 0.60 mm. wide.

*Remarks.*—This species is apparently quite rare, but we must remember that very few of the fish which serve as its host have ever been examined for parasites. It can be at once distinguished from other species by the narrow and elongate cephalothorax and trunk.

### CLAVELLODES, new genus.

*Generic characters of female.*—Parasites of medium size (8 mm.); cephalothorax distinctly separated from and much larger than the trunk, and reflexed against the dorsal surface of the latter; head somewhat enlarged and separated from the neck by a well-defined groove; trunk plump, of varying length, without an abdomen, anal laminae or posterior processes. First antennae slender, three-jointed; second antennae biramose, destitute of claws; first maxillae tripartite, the palp with a single seta; second maxillae so short that the bulla is virtually on the trunk; terminal claw of maxillipeds reinforced near the tip by an accessory claw, behind which the margin is toothed for a distance.

*Generic characters of male.*—Of medium size (1 mm.); body folded upon itself so that the anterior and posterior portions are parallel, while the central portion is at right angles to them, the whole completely fused without any distinction of parts or segmentation; general form ellipsoidal, with the anterior margin almost squarely truncated; mouthparts and genital process crowded together along this margin; no anal laminae.

First antennae indistinctly four-jointed; second antennae biramose, endopod simple, exopod two-jointed; first maxillae similar to those of the female; second maxillae larger and more powerful than the maxillipeds, and pushed so far forward as to be even with, or in front of, the anterior margin of the head.

*Type.*—*Clavellodes rugosa* (*Anchorella rugosa* Krøyer).

(*Clavellodes*, *Clavella* and εἶδος, likeness or appearance.)

*Remarks.*—This new genus is established to include three species which have hitherto been referred to *Clavella*. They differ so much, however, from that genus in the structure of the second antennae, first maxillae and maxillipeds of the female, and in the general form and appendages of the male, that a new genus must be created to receive them. The internal structure of the male, as described and figured under the species *rugosa* (see p. 691), is peculiarly interesting, not only because it shows a marked difference from *Clavella*, but also on account of the structure and arrangement of the entire sexual apparatus. In the female of this new genus the head is widened by the formation of prominent lateral lobes, the second antennae are biramose, and the first maxillae are tripartite. In the male the body is so completely folded on itself that all the appendages and even the genital process are on the anterior margin, level with the anterior border of the head, and they all point forward parallel with the long axis of the body.

### TABLE OF SPECIES.

1. Trunk longer than wide, smooth; cephalothorax slender, scarcely longer than the trunk; genital process present.......................*macrotrachelus* (Brian), 1906.
1. Trunk wider than long, much wrinkled; cephalothorax plump, half as long again as the trunk; no genital process....................*rugosa* (Krøyer), 1837, p. 690.
1. Trunk the same width and length, smooth; cephalothorax in line with the trunk and the same length; genital process present.........*intermedia* (Quidor), 1906.

### CLAVELLODES RUGOSA (Krøyer).

Plate 27, fig. L; plate 51, figs. 190 to 199.

*Anchorella rugosa* Krøyer, 1837, p. 284, pl. 2, fig. 7; pl. 3, fig. 14 *a* to *c*.—T. Scott, 1900, p. 176, pl. 8, figs. 45 to 48.

*Host and record of specimens.*—Ten females with egg strings and four attached males were obtained from the gills of the wolf fish, *Anarrhichas lupus*, off Race Point, Gloucester, July 25, 1879, in 31 fathoms of water. They have been given Cat. No. 39616, U.S.N.M.

Another lot consisting of 15 females was taken from the gills of the same host at Casco Bay, Me., July 16, 1873, and has been given Cat. No. 43592, U.S.N.M.

*Specific characters of female.*—Cephalothorax considerably longer than the trunk and bent backward against the dorsal surface of the latter; head distinctly separated from the neck by a well-defined groove, flattened dorso-ventrally, enlarged at the sides into two prominent lateral lobes, which reach forward to the bases of the first antennae; neck stout, cylindrical, and covered with transverse wrinkles; trunk subquadrate, flattened a little dorso-ventrally, and with its entire surface thrown up into ridges and furrows; anterior and posterior margins reentrant; bulla in the bottom of the hollow at the anterior end, genital orifice in a corresponding position at the posterior end; egg strings broad, nearly twice the length of the trunk, and tapering posteriorly; eggs arranged in 10 to 15 rows, about 20 eggs in each row.

First antennae three-jointed, the basal joint much wider and longer than the others; second antennae biramose, the endopod much larger than the exopod, and the two rami turned down across the frontal margin, with their tips just meeting at the midline; exopod two-jointed, endopod one-jointed, with the tip and frontal margin armed with short spines; mouth tube broad, strongly tapered, with its tip just touching the second antennae; first maxillae tripartite, the outer ramus much shorter and smaller than the other two; palp bent down across the front of the maxilla and tipped with a single knobs and processes, irregularly arranged, and against which the terminal claw shuts; the latter is large and stout, with an accessory claw on the inner margin near the tip and behind it a row of short saw teeth.

Color (preserved material), grayish-yellow, egg strings orange.

Cephalothorax, 5 mm. long, 1.25 mm. wide. Trunk, 3.2 mm. long, 4 mm. wide. Egg strings, 6 mm. long.

*Specific characters of male.*—Body completely folded together and fused, so that all the appendages and the genital process are crowded along the frontal margin; general form an ellipsoid, flattened laterally and truncated anteriorly, with an even curvature and a smooth surface; no dorsal carapace, but a short central rostrum projecting over the mouth tube.

First antennae four-jointed, the basal joint much larger than the others; second antennae biramose, the exopod two-jointed and tipped with a tuft of short setae, the endopod smooth except for a single spine on the outer margin; first maxillae similar to those of the female; second maxillae large and stout, with a long and powerful terminal claw; maxillipeds shorter but just as strong.

The internal anatomy of this male is shown in figure 198 and may be described as follows: The esophagus (*oe*) is slender and nearly straight; its dorsal wall is only a single cell in thickness, while in the ventral wall two rows of nuclei may be seen, and there is a corresponding increase in thickness. The stomach (*s*) lies close to the dorsal surface and is abruptly and considerably enlarged at the anterior end. It passes insensibly into the intestine, which curves around the posterior part of the trunk, still close to the dorsal surface, and ends blindly at the point *e*. The frontal secretory gland (*fg*) is very similar to that in *Achtheres*, and fills the entire front of the head above the esophagus. The median center of the maxillipedal gland (*mp*) may be seen between the dorsal surface of the stomach and the adjacent body wall; the lateral centers appear in other sections. These excretory glands are much reduced in such dwarfed males, and although the centers are fairly distinct the ducts can not be discerned. There is about the same difference between the infra- and supra-esophageal ganglia as was found in *Achtheres*. The supra ganglion (*sg*) is oval in section and sends out a good-sized nerve to the frontal margin. Another nerve extends from the posterior end to the frontal gland, the anterior end of the stomach, and the median center of the maxillipedal gland. The infra ganglion (*ig*) is much larger and very irregular in outline, and supplies the lower lip, the various mouth-parts, and the reproductive organs. These latter consist of a pair of testes with their deferent ducts, a spermatophore receptacle, and the duct which leads from the latter to the external surface. The testes (*t*) are relatively large and ellipsoidal in form, and instead of being located between the stomach and the dorsal body wall, as in *Achtheres*, they are placed below and on either side of the stomach and intestine, nearly in the center of the posterior part of the body. At the posterior end of the testis may be seen the spermatogonia (*stg*) with their large, spheroidal nuclei; passing forward we find the primary and secondary spermatocytes (*stc*) considerably reduced in size, and finally at about the center of the testis, the spermatozoa (*sp*). These gradually arrange themselves with their long diameter parallel to the axis of the testis. Toward the forward end where the testis narrows, the spermatozoa are bunched together and pass in this form out into the deferent duct. Around the anterior end of the testis and lining the walls of the deferent duct are large pear-shaped gland cells (*gc*), which secrete the material that forms the outer covering of the spermatophores. Around the anterior end of the testis these cells all have their large ends outward and their small ends inward, thus bringing about the necessary reduction in diameter at the opening of the deferent duct. Along the walls of the latter they are more irregular in shape, and are arranged in no definite order. The deferent duct bends completely around as soon as it leaves the testis and passes back just beneath the latter to its posterior end. There it again turns completely around and passes forward, opening to the surface at the tip of the genital process just behind the second maxillae. In this last section, which may be called the spermatophore receptacle, the gland cells entirely disappear from the walls, and the bunched spermatozoa, already surrounded by the cement substance, are molded into spermatophores (*sph*).

Color (preserved material), a dirty white.

Total length, 1.15 mm. Greatest width, 0.65 mm.

(*rugosus*, rough, alluding to the body and neck of the female.)

*Remarks.*—This species was first described by Krøyer in 1837, and later by Baird (1850), van Beneden (1851), and T. Scott (1900).

The specimen described and figured by Baird does not agree with the others and certainly was not the present species. Moreover, it was obtained from a different host, "*Gadus cellarius;*" the other descriptions agree and the specimens were all obtained from the same host. Scott says of it:

> I find also on the codfish what appears to be the same species of *Anchorella*. It is evident, however, that these organisms, so far as the British species are concerned, require a more careful study than they have yet received (1900, p. 176).

After such a study of the specimens in the United States National Museum it has been deemed best to make this species the type of a new genus, which resembles *Clavella* in general characters, but differs in many details.

### CLAVELLISA, new genus.

*Generic characters of female.*—Cephalothorax much longer than the trunk, slender and often wrinkled, attached to the center of the dorsal surface of the trunk; head distinctly separated from the neck, slightly enlarged and covered with a dorsal carapace; trunk wider than long, somewhat flattened dorso-ventrally, and destitute of abdomen, anal laminae, genital, or posterior processes; egg strings short and wide, sometimes at an angle with the body.

First antennae exceptionally large and heavily armed, the spines often flattened like a knife blade and projecting far in front of the head. Second antennae biramose, the two rami at right angles to the basal portion and turned across the frontal margin. First maxillae usually bipartite, the palp with a single seta; second maxillae short and laminate; maxillipeds of the usual pattern.

*Generic characters of male.*—General form ovoid, the anterior portion covered with a carapace; body folded upon itself and thoroughly fused without any distinction of parts or segmentation; mouth tube, appendages, and genital process on the ventral surface at different angles with the body axis, and not crowded together, as in *Clavellodes*. First antennae three-jointed, basal joint much larger than the others; second antennae biramose, the rami cylindrical and unjointed; first maxillae tripartite; second maxillae and maxillipeds long and armed with strong claws; genital opening at the tip of a prominent knob behind the second maxillae.

*Type.*—*Clavellisa spinosa*, new species.

(*Clavellisa*, *Clavella* and ἴσος, similar in appearance.)

*Remarks.*—This is another new genus and includes two new species and three that have been heretofore included in the genus *Anchorella*. The first and most noticeable peculiarity of the genus is the attachment of the cephalothorax to the dorsal surface of the trunk, at about its center. Apparently it has no connection whatever with the second maxillae; in other words the second maxillae have migrated backward the whole length of the neck, and have then moved along the outer surface of the trunk until they are some distance away from the base of the neck.

Then the first antennae are much enlarged, have become rigid, and project straight forward, being armed, at least in one species, with large and wicked spines, totally unlike anything known in the entire family of Lernaeopodidae. In the male while there has been a folding and complete fusion of the body, it has not been carried as far as in *Clavella* and *Clavellodes*. The posterior portion of the

the genital process and appendages stand at the same angle.

TABLE OF SPECIES.

1. First antennae armed with stout spines, rigid, and projecting in front of the head; egg strings at an angle of 45° with the trunk axis..*spinosa*, new species, p. 694.
1. First antennae well armed, but flexible and not projecting in front of the second pair; egg strings parallel with trunk axis.............................. 2.
2. The trunk spherical or ovoid and without any posterior invagination at the center. 3.
2. The trunk flattened dorso-ventrally and emarginate posteriorly at the center.... 4.
3. Cephalothorax more than three times the length of the trunk; the latter spherical ..............................................*scombri* (Kurz), 1877.
3. Cephalothorax only one-half longer than the trunk; the latter ovoid. *ovalis* (Krøyer), 1837, p. 696.
4. Cephalothorax twice the length of the trunk; the latter subrectangular in outline.........................................*emarginata* (Krøyer), 1837.
4. Cephalothorax only one-third longer than the trunk; the latter heart-shaped. *cordata*, new species, p. 697.

### CLAVELLISA SPINOSA, new species.

Plate 50, figs. 188 and 189; plate 52, fig. 200.

*Host and record of specimens.*—Eight specimens, including both sexes, were obtained from the gill rakers of the menhaden, *Brevoortia tyrannus*, at Beaufort, North Carolina, August, 1905. They have received Cat. No. 39556, U.S.N.M. One female was obtained by Doctor Linton from the same host and locality, and has received Cat. No. 39612, U.S.N.M. Five females and two males were taken by Dr. M. T. Thompson from the same host at Woods Hole, Massachusetts, August 6, 1901, and have received Cat. No. 39803, U.S.N.M. A single female from the first Beaufort lot, carrying an attached male on the side of the neck, is made the type of the new species, and is given Cat. No. 43547, U.S.N.M.

*Specific characters of female.*—Cephalothorax proportionally slender, from three to five times the length of the trunk, tapering from the trunk toward the head, and turned back so that its dorsal surface rests against that of the trunk; head not enlarged, but strongly narrowed anteriorly, where it terminates in three projections made up of the antennae and the mouth tube, covered dorsally with a fairly distinct carapace; neck usually profusely wrinkled; trunk nearly twice as wide as long, flattened on the dorsal surface, and kidney- or bean-shaped, the arms extending from the eye of the bean; the swollen sides of the trunk are filled with the convolutions of the oviducts and increase in size and convexity with the maturing of the eggs; no abdomen, anal laminae, genital or posterior processes; egg strings ellipsoid or kidney-shaped and attached not by one end, but near the middle of one side, causing them to stand at an angle of

First antennae imperfectly three-jointed, projecting far in front of the second pair, relatively very large, and with a wicked armature. At the tip are four stout ventral spines and two dorsal ones, the latter as long as the antennae themselves and usually surrounded by a wide membranous flange; the second joint also carries a pair of stout spines on its dorsal surface. This armature is totally different from anything found in the entire family and must be quite effective for piercing the skin of the host. Second antennae biramose, the terminal joints turned squarely across the frontal margin at right angles to the basal joint, the exopod (ventral) smaller than the endopod (dorsal), each bluntly rounded and armed with a single short and stout spine. Mandible long and slender, with a narrow neck, the tip enlarged and armed with eight well-rounded teeth. First maxillae tipped with three stout spines, the outer of which is sometimes surrounded with a membranous flange; palp armed with a single spine. Second maxillae short and stout, laminate, not tapering, united only at the tips, and furnished there with a long and rather slender club-shaped bulla, the pedicel of which is enlarged and forked at the apex, where it incloses a small and solid sphere. Maxillipeds with a stout basal joint and a long and slender terminal claw, with no accessory armature.

Color, trunk transparent cartilage color; oviducts and eggs white; cephalothorax usually black or blackish from the contents of the digestive tube.

Cephalothorax and second maxillae, 1.50 mm. long, 0.15 mm. wide. Trunk, 0.50 mm. long, 0.85 mm. wide. Egg strings, 0.60 mm. long, 0.35 mm. wide.

*Specific characters of male.*—Body completely folded upon itself and so thoroughly fused that there are no traces of parts or segmentation; egg-shaped, with the head at the pointed end, and the appendages and genital process on one side of the egg; head covered with a dorsal carapace, which extends back of the second maxillae. First antennae three-jointed, tipped with stout setae; second antennae similar to those of the female, but not bent, the exopod larger than the endopod, both rami unsegmented and tipped with two small spines; mandibles and first maxillae like those of the female; second maxillae long, with a slender second joint and rather a weak terminal claw; maxillipeds with a large and stout basal joint and a slender terminal claw, armed with a row of minute teeth along its inner margin.

Color, a uniform yellowish-white.

Total length, 0.25 mm. Greatest width, 0.125 mm.

(*spinosus*, covered with spines, alluding to the first antennae.)

*Remarks.*—This species is fairly common on the menhaden, but only one or two specimens are found upon the same fish. It can be at once distinguished by its minute size, by the long and slender cephalothorax, and by the kidney-shaped egg strings, carried at an angle with the trunk axis. Different specimens vary considerably in the size and armature of the antennae, as well as in the angle at which the egg strings are carried. The males correspond more closely than the females, and there is enough conformity among the latter to insure the validity of the species.

### CLAVELLISA OVALIS (Krøyer).

*Anchorella ovalis* Krøyer, 1837, p. 289, pl. 3, fig. 6*a* and *b*.

*Host and record of specimens.*—Krøyer found a single specimen of this species, without egg strings, on the gills of *Trigla gurnardus;* no locality given.

*Remarks.*—From Krøyer's description and figure it is certain that he had a Lernaeopod very similar to the "*Anchorella emarginata*" which he had just described. In distinguishing the two he says that in *A. ovalis* the trunk is thick and egg-shaped, the cephalothorax is one and a half times as long as the trunk and of medium thickness, the head is short and broad, but thick. His figure shows that the cephalothorax is attached to the center of the dorsal surface of the trunk, while the second maxillae are attached to the ventral surface some distance from the base of the neck.

He did not describe the appendages at all, but the above facts are enough to locate the species in the present genus.

Beneden afterwards (1870, p. 31, pl. 2, fig. 8) figured a parasite which he referred to this species, but which certainly did not belong here as can be seen from a comparison of Krøyer's and Beneden's figures. Beneden's species had a short and thickset cephalothorax attached in the usual way to the anterior end of the trunk, while the second maxillae were on the neck some distance above where it joins the trunk.

Earlier in the same paper (p. 270) Krøyer described a species which he named "*Lernaeopoda obesa.*" He had but a single specimen and had forgotten the host, but thought it was "*Squalus acanthius* Linn." In 1869 Olsson found the same parasite upon the gill arches of the common gurnard, *Trigla gurnardus*, and transposed it to the genus *Brachiella.* It is this species *obesa* rather than the species *ovalis* which Beneden and Scott have found upon the gurnard (see p. 701). It belongs in the genus *Brachiella* where Olsson placed it, but Krøyer's *ovalis* just as certainly belongs here in the genus *Clavellisa.*

Plate 26, fig. E; plate 50, fig. 187; plate 52, figs. 201 to 208.

*Host and record of specimens.*—Twelve females and four males were obtained by Vinal N. Edwards from the gills of the hickory shad, *Pomolobus mediocris*, at Woods Hole, October 30, 1903. They have received Cat. No. 39566, U.S.N.M. and become paratypes of the new species.

A single female with attached male was taken from this lot and made the species type, with Cat. No. 43539, U.S.N.M.

A second lot of 20 specimens, including both sexes, was obtained from a single hickory shad at the same locality in September, 1902; they have received Cat. No. 39579, U.S.N.M.

A third lot of 10 specimens, including both sexes, was taken from the gills of the alewife, *Pomolobus pseudoharengus* at Woods Hole, October 5, 1887, and has received Cat. No. 43534, U.S.N.M.

Two lots, containing three females each, were obtained from the gills of young shad, *Pomolobus mediocris*, taken in the pound at Woods Hole, July 8, 1875, by A. E. Verrill; they have received, respectively, Cat. Nos. 39622 and 38026, U.S.N.M.

Three females were obtained by Dr. M. T. Thompson from the gills of the alewife at Woods Hole, August 10, 1901; they have received Cat. No. 39595, U.S.N.M.

*Specific characters of female.*—Cephalothorax longer than the trunk, slender, cylindrical, and about the same diameter throughout; head not enlarged, but narrowed anteriorly and covered with a dorsal carapace; trunk heart-shaped, of the same width and length, flattened dorso-ventrally, narrowed anteriorly, and with a median posterior sinus; cephalothorax attached to the dorsal surface of the trunk a little in front of the center; egg strings cylindrical and about as long as the trunk; eggs small, in 8 longitudinal rows, about 20 eggs in a row.

First antennae stout, indistinctly three-jointed, with a tuft of small setae at the tip; second antennae also stout, the terminal biramose portion swollen, turned at right angles to the basal portion and bluntly rounded; exopod one-jointed and armed with a single stout spine, endopod indistinctly two-jointed, with two minute terminal spines. Mandibles with a narrowed neck and a widened blade, armed with five large curved and bluntly rounded teeth. First maxillae with two terminal setae, the palp with a single seta; second maxillae attached at the anterior end of the trunk some distance from the base of the neck, short, cylindrical, not tapering, squarely truncated at the tips, where they are united by their inner corners; bulla long, slender, and club-shaped.

Maxillipeds with a stout basal joint and a short and stout terminal claw, curved at the tip, where it carries on the inner margin a long accessory claw, behind which is a row of saw teeth.

Color, a uniform yellowish-white, the contents of the stomach and intestine dark brownish-black; egg strings orange yellow.

Cephalothorax, 4 mm. long, 0.50 mm. wide. Trunk 3 mm. long, 3 mm. wide at the posterior end. Egg strings 3.5 mm. long, 0.8 mm. wide.

*Specific characters of male.*—Body folded on itself in the same way as in *spinosa*, swollen, with no distinction of parts or segmentation; a dorsal carapace on the head; genital process larger than in *spinosa;* no anal laminae. First antennae three-jointed and well armed with setae; second antennae biramose, the exopod two-jointed and tipped with a tuft of setae, the endopod slender, ellipsoidal, and unarmed. Mouth tube long and prominent, projecting its entire length in front of the carapace.

First maxillae much shorter than in the female and projecting just to the tip of the mouth tube; second maxillae rather slender, the basal joint long and narrow. Maxillipeds with a stout and thick basal joint and a terminal claw like that of the female.

Color, a uniform yellowish-white.

Total length, 0.30 mm. Greatest width, 0.20 mm.

(*cordatus*, heart-shaped, alluding to the trunk.)

*Remarks.*—This species is fairly common on the two kinds of herring mentioned. It may be recognized by the heart-shaped trunk with the long and slender cephalothorax attached to its dorsal surface. If there is need of any further distinction from *spinosa* it may be found in the egg strings, which are here attached by one end, are parallel with the trunk axis, or are curved like parentheses marks. In the ripening ovary of this species the thread or filament connected with the oocyte is much longer than in *Achtheres*, and contains often as many as 20 cells (fig. 187, pl. 50).

### Genus BRACHIELLA Cuvier.

*Generic characters of female.*—Cephalothorax elongate and cylindrical, flexed more or less backward, often against the dorsal surface of the trunk; head usually enlarged and covered by a distinct dorsal carapace; trunk swollen, flattened dorso-ventrally, and in the larger species (10 to 25 mm.) with two rows of pits or grooves or knobs on the dorsal and ventral surfaces; two or four paired posterior processes and an unpaired genital process; no abdomen or anal laminae; egg strings long and slender.

First antennae two to four (usually three) jointed, basal joint more or less swollen; second antennae biramose, the exopod (ventral) ordinary bulla, sometimes fused; maxillipeds with a stout basal joint and a long terminal claw.

*Generic characters of male.*—Cephalothorax inclined more or less to the trunk, from which it is separated by a well-defined constriction and often by a short neck; head covered by a dorsal carapace which varies considerably in size; trunk straight, spindle-shaped, and much narrower than the cephalothorax; small anal laminae sometimes parallel with the trunk axis, sometimes at right angles to it; often with a large unpaired (genital) process between the second maxillae. First antennae three-jointed, about the same length as the second pair; the latter biramose, both rami one-jointed, the exopod (ventral) sometimes with two joints; first maxillae three or four partite; second maxillae and maxillipeds close together and about the same size, both provided with stout curved claws.

*Type.—Brachiella thynni* Cuvier.

(*Brachiella*, *βραχίων*, arm, with diminutive ending.)

*Remarks.*—This genus, like *Clavella*, has received many species which ought never to have been assigned to it. For a long time the distinction between the two genera consisted simply in the separation or fusion of the second maxillae. If they were fused the species was placed in the genus *Clavella*; if they were separate it was referred to the genus *Brachiella*, irrespective of its other morphological peculiarities. Consequently, we find here also many species which must be transferred to other genera, or for which new genera must be created. The list which follows includes such species. There is rather more dissimilarity amongst the males than in the other genera but they agree very well in all essential characters. Probably when the species, and especially the males, become better known it will be necessary to separate some more of them and establish other new genera. Even the data already known with reference to such species as *concava* and *lophii* make it practically certain that they must eventually be placed elsewhere. But until we can get the necessary data it is better to keep them here where they were originally placed.

*Synonyms.—Brachiella anserina* Wilson, 1908, p. 467, differs in so many and so important particulars from the *Brachiella* here established that it has been made the type of a new genus, *Probrachiella* (see p. 716).

*Brachiella antarctica* Quidor, 1906, p. 30, pl. 3, figs. 45 to 48, has no posterior processes, the exopod of the second antennae is unsegmented, the second maxillae are entirely separate, and the male differs so much from *Brachiella* that it has been made the type of a new genus, *Eubrachiella* (see p. 716).

*appendiculosa* Bassett-Smith, 1898, p. 14, are both synonyms of *Thysanote appendiculata* (see p. 651).

*B. dentata* Wilson, 1912, p. 97, is proved by the structure of the male to belong to the genus *Charopinus* (see p. 654).

*B. fimbriata* Heller, 1865, p. 240, belongs to the genus *Thysanote* (see p. 651).

*B. gaini* Quidor, 1912, p. 211, is placed with *B. antarctica* in the new genus *Eubrachiella* (see p. 716).

*B. impudica* Nordmann, 1832, p. 92, is proved by the structure of the male as well as the female to be distinct from *Brachiella* and is made the type of the new genus *Epibrachiella* (see p. 715).

*B. inconcinna, minuta,* and *ramosa* were simply named by Richiardi (1880, p. 151) and have never been described or figured.

*B. insidiosa* Heller, 1865, p. 239, is referred to the new genus *Parabrachiella* (see p. 713).

*B. lobiventris* Heller, 1865, p. 241, belongs to the genus *Thysanote* (see p. 651).

*B. lophii* Milne Edwards, 1840, p. 514, was briefly described and well figured, but has never been seen by any other investigator, although it is included in two or three lists on the authority of Milne Edwards. The description and figures given by the latter are enough to indicate fairly well that the species does not belong to *Brachiella*, nor indeed to any of the other genera in the family.

The size of the creature (cephalothorax and second maxillae 20 mm.; trunk and posterior processes 16 mm.), the structure of the second antennae, first maxillae (unipartite), and maxillipeds, and the peculiar shape and attachment of the posterior processes show little affinity with any of the genus types here presented.

But the male is unknown and the data are not sufficient to enable us to erect a new genus, so the best that can be done is to leave it where Milne Edwards placed it and wait for further details.

*B. malleus* Nordmann, 1832, p. 95, is proved by the structure of the male, as well as certain characters of the female, to belong to the genus *Charopinus* (see. p. 654).

*B. multifimbriata* Bassett-Smith, 1898, p. 96, is shown by the structure of the male to be distinct from *Brachiella*, and as the female is also peculiar it is made the type of a new genus, *Thysanotella* (see p. 652).

*B. neglecta* Richiardi, 1880, p. 151, was another mere name, but it was afterwards briefly described and figured by Brian (1898. p. 24, pl. 4, fig. 29). He, however, mentions and portrays a pair of tubercles, each armed with a claw, on the posterior margin of the trunk. Nothing like them is known anywhere among the Lernaeopods, and if correct the parasite would at least become a distinct genus. But it has

*B. obesa* (Krøyer), 1837, p. 270, was described as belonging to the genus *Lernaeopoda.* Krøyer had but a single specimen and had forgotten on what host it was found, but said he thought it was "*Squalus acanthius* Linn." Olsson found the same parasite in the throat of *Trigla gurnardus*, and on account of the elongate cephalothorax and the removal of the second maxillae some distance behind the other mouth parts, he transferred it to the genus *Brachiella* (1869, p. 42), where it rightly belongs

In 1870 P. J. van Beneden reported (p. 10) the same species from "*Spinax acanthius* L." on the coast of Belgium. He also reported (p. 31), from the gills of *Trigla gurnardus*, a species which he called "*Anchorella ovalis* Krøyer," and of which he gave a figure (pl. 2, fig. 8). But this figure shows no similarity whatever to Krøyer's *ovalis*, while it does resemble in all essential particulars his *Lernaeopoda obesa.*

T. Scott described (1901, p. 133) from the gills of *Trigla gurnardus* on the Scottish coast a parasite which he referred to Krøyer's *A. ovalis*, basing his judgment upon Beneden's figure. But as Beneden was wrong, so of course Scott was misled, and the species he had was not *ovalis* at all, but *obesa.* The excellent figures given by Scott (pl. 7, figs. 30 to 35) leave no doubt that he was really dealing with the same species examined by Krøyer and Olsson. But it belongs in the genus *Brachiella* where Olsson placed it, and is here restored to that genus.

Richiardi in the list already mentioned (1880, p. 151) named a parasite which he obtained from "*Trigla corax*" in the Mediterranean, *Brachiella obesa*, but gave no description or figures. This was probably the same as Krøyer's species, but even if it was not Krøyer's name holds precedence.

*B. oblonga* Valle, 1880, p. 76, is another mere name and has never been described or figured.

*B. ovalis* (Beneden) Scott, 1901, p. 133, as shown above, is a synonym of *obesa.*

*B. parkeri* Thomson, 1889, p. 374, can not belong to any of the genera previously described and is made the type of the new genus *Thomsonella*, closely related to *Brianella* (see p. 649).

*B. pastinacae* Beneden, 1851, p. 118, is a synonym of *Charopinus bicaudatus* (see p. 656).

*B. pernettiana* (Blainville), 1822, p. 439, was originally described and figured as a "Lernaean" by Pernetti (1770, vol. 1, pl. 1, figs. 5, 6).

Blainville included it in his new genus *Lernaeomyzon* and gave a brief description. Cuvier (1830, p. 257) referred it to the genus

*Brachiella*, but added nothing further in the way of description, and thus we are left with insufficient data to locate it intelligently.

*B. rostrata* Krøyer, 1837, p. 207, differs so radically in both sexes from *Brachiella* that it is made the type of a new genus, *Parabrachiella* (see p. 714).

There are thus five species which are mere names, three which can not be satisfactorily located, and 16 which must be transferred to other genera, including six which become new genus types.

### TABLE OF SPECIES.

1. Only two posterior processes, dorsal to the egg strings ........ 2.
1. Only two posterior processes, ventral to the egg strings ........ 3.
1. Four posterior processes, two dorsal and two ventral ........ 7.
2. Posterior processes pear-shaped with a narrow pedicel; first maxillae unipartite; both rami of second antennae unsegmented ........ *lophii* Milne-Edwards, 1840.
3. Posterior processes cylindrical, widely separated; first maxillae tripartite; exopod (ventral) of second antennae two-jointed ........ *concava* Wilson, 1913, p. 703.
3. Trunk ovoid, considerably longer than wide; posterior processes minute and conical; genital process present ........ 4.
3. Trunk ovoid, about the same length and width; posterior processes larger; no genital process ........ 5.
3. Trunk swollen, wider than long; posterior processes large and laminate; genital process rudimentary ........ 6.
4. Second maxillae as long as the cephalothorax, cylindrical and slender; first antennae four-jointed and slender ........ *bispinosa* Nordmann, 1832.
4. Second maxillae half as long as the cephalothorax, cylindrical and slender; first antennae three-jointed and stout ........ *exigua* Brian, 1906.
4. Second maxillae half as long as the cephalothorax, stout and flattened; first antennae three-jointed and slender; posterior processes laminate. *mitrata*, new species, p. 709.
5. Posterior processes cylindrical, bluntly rounded; second maxillae short and stout; egg strings as long as the trunk ........ *pinguis*, new species, p. 710.
5. Posterior processes conical, with an acute point; second maxillae long and slender; egg strings twice the length of the trunk ........ *nitida*, new species, p. 711.
6. Trunk irregular, covered with lobes and processes, emarginate posteriorly; first antennae short and two-jointed ........ *triglae* Claus, 1860.
6. Trunk smooth and regular, rounded posteriorly; first antennae four-jointed, swollen ........ *obesa* (Krøyer), 1837, p. 701.
7. The four posterior processes about the same length ........ 8.
7. Ventral posterior processes distinctly longer than dorsal ........ 11.
7. Dorsal posterior processes distinctly longer than ventral ........ 12.
8. Size large (10 mm.); head enlarged and covered with a dorsal carapace; second maxillae separate to their tips ........ 9.
8. Size small (5 mm.); head not enlarged, no carapace; second maxillae fused for their entire length ........ 10.
9. Genital process half as long as posterior processes; maxillipeds huge, each nearly as large as the entire head; second maxillae smooth... *chevreuxii* Beneden, 1891.
9. Genital process minute; maxillipeds of normal size; first antennae two-jointed; second maxillae much wrinkled ........ *appendiculosa* (Krøyer), 1863, p. 712.
10. Ventral processes close together, dorsal ones far apart; genital process present; second maxillae smooth ........ *appendiculata* (Krøyer), 1863.
10. Ventral processes close together, dorsal ones far apart; genital process present; second maxillae wrinkled ........ *hostilis* Heller, 1865.

three-jointed.................................*gracilis* Wilson, 1908, p. 712.

11. Trunk smooth; second maxillae much shorter than cephalothorax; first antennae three-jointed; genital process long and club-shaped.*gulosa*, new species, p. 705.

11. Trunk smooth; second maxillae very short; first antennae three-jointed; genital process long and cylindrical......................*merluccii* Bassett-Smith, 1896.

11. Trunk with two rows of pits or grooves on the dorsal and ventral surfaces; second maxillae short; first antennae four-jointed; no genital process.
*elegans* Richiardi, 1880, p. 707.

12. Trunk wider than long; dorsal processes abruptly curved near their tips.
*chavesii* Beneden, 1891.

12. Trunk longer than wide; dorsal processes straight; two rows of pits on the dorsal and ventral surfaces of the trunk..................*thynni* Cuvier, 1830, p. 703.

### BRACHIELLA CONCAVA Wilson.

*Brachiella concava* Wilson, 1913, p. 262, pl. 51.

*Host and record of specimens.*—A single female with egg strings was taken from the gill arch of a sting ray, *Dasyatis hastata*, at Montego Bay, Jamaica, August 10, 1910. This was made the species type and received Cat. No. 42286, U.S.N.M.

*Remarks.*—This species was fully described and figured in the reference above given. It is not common, but may be recognized by the size and shape of the posterior processes and the absence of a genital process. But these posterior processes are dorsal and not ventral, and are only found in one other species, *lophii*, which probably does not belong to the present genus, as already stated (p. 700). That throws the burden of proof on the present species if it is to remain in the genus, but this can not be decided fully until the male is found. When that occurs it is very possible that the species will be transferred to the genus *Charopinus*.

### BRACHIELLA THYNNI Cuvier.

Plate 25, fig. C; plate 53, figs. 209 to 215.

*Brachiella thynni* Cuvier, 1830, p. 257, pl. 15, fig. 5.
*Thynnicola ziegleri* Miculicich, 1904, p. 47.

*Host and record of specimens.*—A single female with egg strings was taken from the gills of a tunny fish at Cornwall, England, and sent to the United States National Museum by Rev. A. M. Norman. It was numbered 8342, U.S.N.M. Twenty-five females and four males were obtained from the gills of *Thynnus thynnus* at Bakar, Croatia, Hungary, by Prof. S. Brusina. They have received Cat. No. 43458, U.S.N.M.

*Specific characters of female.*—Cephalothorax as long as the trunk, cylindrical, and usually bent slightly backward; head little if any enlarged, but covered with a distinct dorsal carapace; neck the same diameter throughout, and separated from the trunk by a well-defined groove; trunk ovate, flattened dorso-ventrally, and in older specimens much wrinkled; at least two segmentations plainly indicated by breaks in the ventral musculature, by ventral grooves, and by lateral indentations; two pairs of posterior processes, one dorsal, the other ventral, the latter usually half the diameter and length of the former, and closer together; both pairs curved like parentheses marks, and the bases of the dorsal pair curved around inside the point of attachment as two small knobs, side by side on the median line; no genital process; egg strings between the two pairs of processes and a little longer than the dorsal pair; eggs minute, arranged in 10 or 12 longitudinal rows, fully 75 eggs in the longest rows.

First antennae stout, three-jointed, unarmed; second antennae turned down across the frontal margin, the exopod minute, degenerate, and nearly fused with the endopod. First maxillae large and stout, tripartite, each ramus swollen at the base and tipped with a single spine; palp also swollen, turned at right angles to the rest of the appendage and tipped with a single spine.

Second maxillae small and short, and free to the very tips, each maxilla ending in a semilunar attachment disk; the edges of the disks are grown together, but apparently they do not form a single bulla. At the base of each maxilla on the dorsal surface is an oblong ridge or projection, which runs lengthwise of the appendage and contains the maxillary gland.

Maxillipeds widely separated, so that all the other mouth parts can be seen between them in ventral view; basal joint triangular and much longer than wide; terminal claw slender, and tipped with a single spine which shuts into a depression on the inner margin of the basal joint; no accessory spine.

Color (preserved material), a rich golden yellow.

Cephalothorax, 6 mm. long, 1 mm. wide. Trunk, 6 mm. long, 3 mm. wide. Dorsal posterior processes, 8 mm. long. Egg strings, 9 mm. long.

*Specific characters of male.*—Head at an angle of 45° with the body axis and covered with a well-defined carapace; posterior cephalothorax contracted into a narrow, wasplike waist, where it joins the trunk; the latter ovate, with a pair of slender conical anal laminae at the pointed posterior end, on the dorsal surface. Ventral to the anal laminae is the rounded genital process, which is a little longer and much thicker than the laminae.

First antennae stout and three-jointed; second antennae biramose, the endopod tipped with a single spine, the exopod with a minute chela. Mouth tube large and in line with the axis of the head; first maxillae short and wide, like a hand with three fingers and a thumb, each tipped with a single spine. Second maxillae large, widely separated, each tipped with a long curved claw. Maxillipeds close together, the basal joint much longer than wide, the terminal claw sharply bent.

Color the same as that of the female.

Total length, 2.25 mm. Greatest diameter, 0.5 mm.

(*thynni*, the generic name of the host.)

*Remarks*.—This species is one of the largest of the genus, and was first described by Cuvier, who made it the type-species of his new genus *Brachiella*. Since then it has been described or noticed by almost every writer on the parasitic copepods, and always under the same name, with one exception. Miculicich, supposing it to be new, gave a long account of it with text figures [1] and named it *Thynnicola ziegleri*. This mistake he himself corrected in March, 1905, in the same periodical. But in spite of the fact that it is so universally known, there are still several things in connection with its structure that need either correction or further description. For this reason the above account has been given, with such figures as seemed necessary. The facts here established are:

1. The body of the female is as fully segmented as that of *Achtheres*, and the segmentation is similarly indicated.
2. The head is covered with a well-defined dorsal carapace.
3. The neck is separated from the trunk by a groove behind the second maxillae.
4. There is no genital process.
5. The second antennae are biramose, the exopod (ventral ramus) being rudimentary.
6. The first maxillae have a palp at right angles to the body of the appendage.
7. The maxillipeds are widely separated.

### BRACHIELLA GULOSA, new species.

Plate 53, figs. 216 to 220; plate 54, figs. 221 to 224.

*Host and record of specimens*.—Three lots of this parasite were obtained by Dr. Hugh M. Smith from the under surface of the operculum of the channel bass, *Scienops ocellatus*, from the Center Market at Washington, District of Columbia. The first lot, ten females and two males, were captured off Elizabeth City, New Jersey, and were given Cat. No. 43588, U.S.N.M. The second lot, eighteen females and four males, were captured off the North Carolina coast, and have received Cat. No. 39578, U.S.N.M. The third lot, five females and one male, were captured near Morehead City, North Carolina, and bear Cat. No. 39580, U.S.N.M. A single female with attached male has been taken from the first lot and given Cat. No. 43585, U.S.N.M., as the type of the new species. Ten females and one male were taken off New York City, September 1, 1901, by Mr. Blackford; they have received Cat. No. 39581, U.S.N.M. Three females were taken at Woods Hole, Massachusetts, by the late Dr. M. T. Thompson, which have been given Cat. No. 39591, U.S.N.M. Seven females and one male were taken off the North Carolina coast, and have received Cat. No. 39573, U.S.N.M. The host is the same for all these specimens, the channel bass, *Scienops ocellatus*.

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[1] Zool. Anz. for Sept., 1904.

*Specific characters of female.*—Cephalothorax stout, cylindrical, and considerably longer than the trunk; head enlarged and covered with a dark brown carapace; neck and second maxillae curved like a sickle; trunk anteriorly narrowed into a short neck where it joins the cephalothorax, posteriorly inflated into a sphere, which is flattened dorso-ventrally; four posterior processes, two dorsal and two ventral, and a genital process between the two latter, short and club-shaped; the ventral posterior processes are straight, parallel, and longer than the dorsal pair, which arise a little in front of the posterior margin and are curved like parentheses marks; between the two pairs are the egg strings, which are from one and a half to two and a half times the length of the processes, and about twice their diameter; eggs small, in from 10 to 12 longitudinal rows, about 50 eggs in a row.

First antennae somewhat swollen at the base and three-jointed; second antennae biramose and turned down across the frontal margin, the endopod (dorsal ramus) large, bluntly rounded, one-jointed, and unarmed, the exopod (ventral ramus) comparatively minute, two-jointed, and terminated by a tuft of small setae.

Mouth-tube short, broad at the base, and hardly reaching the second antennae; first maxillae bipartite, palp one-jointed and tipped with a single spine. Second maxillae short, slender, and entirely separate as far as the bulla, which is in the shape of a flattened sphere. The glands at the bases of these maxillae stand out as prominent knobs on either side of the neck.

Maxillipeds with a stout basal joint and a slender terminal claw which shuts down against a knob on the inner margin of the basal joint.

Color (preserved material), a light brownish-yellow.

Cephalothorax, 4.65 mm. long, 1 mm. wide. Trunk, 3.25 mm. long, 3.25 mm. wide, 2 mm. thick. Second maxillae, 1.50 mm. long. Posterior processes (ventral), 3 mm. long. Egg strings, 6 mm. long, 0.80 mm. wide.

*Specific characters of male.*—Head at an angle of 45° with the body axis, and covered with a distinct dorsal carapace; trunk with the first and second segments forming a narrow neck or waist, the posterior portion narrow ovate and ending in a pair of slender anal laminae, which are conical and at right angles to the trunk axis. First antennae slender and three-jointed; second antennae biramose, the endopod smoothly rounded, the exopod with a single spine at the outer corner. Mouth tube projecting its entire length in front of the anterior margin of the carapace in line with the head axis. First maxillae tripartite, palp tipped with a single spine; second maxillae considerably longer than the maxillipeds and tipped with powerful claws, which shut into a socket on the inner margin of the basal joint.

Maxillipeds short and stout and tipped with a strong claw; genital process distinctly visible between and partly behind the second maxillae, with a fringed or fluted tip.

Color, a whitish-yellow, lighter than the female.

Total length, 1.45 mm. Greatest width, 0.65 mm.

(*gulosus*, gluttonous.)

*Remarks.*—In the second lot of parasites mentioned there were three young females, one of them only 1 mm. long. These females had but a single pair of posterior processes, the ventral ones, but in the largest of the three another pair were just starting on the dorsal surface. Evidently, therefore, the ventral pair are formed first and the dorsal pair grow out later to supplement them. The general appearance, the arched neck, the distinct carapace, the knoblike protrusions of the maxillary glands, the short and slender second maxillae, and the arched dorsal processes distinguish this species from its nearest relatives.

### BRACHIELLA ELEGANS Richiardi.

Plate 54, figs. 226 to 233; plate 55, fig. 234.

*Brachiella elegans* RICHIARDI, 1880, p. 151.—BRIAN, 1899, p. 8, fig. 4.

*Host and record of specimens.*—Five females and a male were obtained from the gill cavity of the amber jack, *Seriola lalandi*, at Woods Hole, Massachusetts, by the late Dr. M. T. Thompson, September 11, 1901.

They have received Cat. No. 39585, U.S.N.M., and since no other specimens are in existence at the present time they will serve as surrogate types of the species.

*Specific characters of female.*—Cephalothorax short, flattened dorsoventrally, and about the same length as the second maxillae; head somewhat enlarged and covered with a dorsal carapace; neck extremely short and passing insensibly into the trunk without any sign of demarcation; trunk elongate-triangular, widest across the posterior margin, which is almost squarely truncated; two pairs of posterior processes and a very short and well rounded genital process; ventral processes originating close to the midline, somewhat divergent and curved like parentheses marks, and three-fourths as long as the trunk; dorsal processes less than half the length of the ventral, originating close to the lateral margins, and widely divergent, in some cases even standing out at right angles to the trunk axis; egg strings about the same length as the trunk; eggs minute, in 6 or 7 longitudinal rows, about 30 eggs in a row.

tips overlapping, the exopod (ventral ramus) much smaller than the endopod and indistinctly two-jointed, the endopod bilobed at the tip and armed with tiny spines.

Mouth tube broad at the base and long enough to overlap the tips of the second antennae. First maxillae bipartite, palp short and stout and armed with a single spine; second maxillae short, held at right angles to the body axis, and separate to the very tip, where they are attached to a large spherical bulla; maxillipeds with a stout basal joint and a slender terminal claw, armed on its inner margin near the tip with a secondary claw; these maxillipeds are attached so far forward that they almost reach to the frontal margin of the head.

Color (preserved material), a dark yellowish-brown.

Cephalothorax, 2.15 mm. long, 2 mm. wide, 1.25 mm. thick. Second maxillae, 1.75 mm. long. Ventral posterior processes, 4.33 mm. long. Egg strings, 5 mm. long.

*Specific characters of male.*—Cephalothorax small and separated from the trunk by a short waist; head covered with a dorsal carapace; trunk spindle-shaped, ending posteriorly in a long conical genital process; no anal laminae. First antennae four-jointed, joints subequal; second antennae biramose, endoped well rounded and armed with a single spine, exopod two-jointed and carrying a terminal tuft of setae. First maxillae with a two-parted tip and a small palp, armed with a single spine; second maxillae remarkably long and slender, over twice the length of the maxillipeds, the terminal claw slender, with a bluntly rounded pad at its base. Maxillipeds triangular and stout.

Color, the same as that of the female.

Total length, 1.35 mm. Greatest width, 0.35 mm.

(*elegans*, elegant or neat in appearance.)

*Remarks.*—This species was first named by Richiardi without any description or figure. It was afterwards identified by Brian, who described the female briefly and illustrated it with a single text figure. There is no doubt that these Woods Hole specimens belong to the same species that Brian figured; whether they are identical with Richiardi's named species can not, of course, be determined with certainty, but, since Brian's and Richiardi's specimens came from the same locality and host, there is a strong presumption that they are identical. A full description, with figures of both sexes, is here published for the first time.

The species closely resembles Heller's *B. insidiosa*, but differs in several important particulars, notably in the relative lengths of the two pairs of posterior processes, in the bilobed exopod of the second antennae, and in the position of the maxillipeds relative to the other mouth parts. The manuscript notes and sketches of Dr. M. T. Thompson have been of great service in making out the foregoing description.

### BRACHIELLA MITRATA, new species.

Plate 54, fig. 225, plate 55, figs. 235 to 238.

*Host and record of specimens.*—Four adult females with egg strings were obtained by Dr. M. T. Thompson from the gills of the tilefish, *Lopholatilus chameleonticeps*, off Woods Hole, Massachusetts. Three of them are numbered 39594, U.S.N.M., and become paratypes; the fourth is made the type of the new species with the number 43559, U.S.N.M. A single rather poor specimen was obtained from the same host and locality by the present author, and has been numbered 39589, U.S.N.M.

*Specific characters of female.*—Cephalothorax short and very thickset, and curved so that the axis of the head is at right angles to the trunk; a small dorsal carapace; groove separating the cephalothorax from the trunk obscure; trunk flattened dorso-ventrally, a little longer than wide, narrowed anteriorly and obliquely truncated (mitered) posteriorly; genital process on the ventral surface with a laminate posterior process on either side of it; egg strings cylindrical and as long as the entire parasite; eggs arranged in 6 longitudinal rows, about 25 in a row.

First antennae three-jointed, the basal joint much stouter than the others, the terminal joint tipped with three stout setae.

Second antennae turned down squarely across the frontal margin, the exopod (ventral) much smaller than the endopod, two-jointed and tipped with two short spines, the endopod rounded and unarmed. First maxillae slender and tipped with two long spines and a shorter one on the outer margin; palp short and stout and tipped with two spines. Second maxillae short, about the same diameter throughout, and separate to the very end, where they are joined to a short-stemmed, button-shaped bulla. Maxillipeds with a stout basal joint and a slender terminal claw, carrying an accessory spine on its inner margin near the tip.

Color (preserved material), a uniform brownish-yellow.

Total length, excluding egg strings, 6 mm. Cephalothorax 2.35 mm. long, 1.15 mm. wide. Second maxillae, 1.15 mm. long. Egg strings, 5 mm. long.

(*mitratus*, mitred or cut off diagonally, alluding to the posterior margin of the trunk.)

*Male.*—Unknown.

*Remarks.*—This species may be readily distinguished by the short and very thick neck, by the laminate posterior processes, and by the oblique truncation of the posterior part of the trunk. Here, again, the notes and sketches of Doctor Thompson have been of great value to the present author.

### BRACHIELLA PINGUIS, new species.

Plate 55, figs. 239 to 244; plate 56, fig. 245.

*Host and record of specimens.*—Two adult females with egg strings, one young female and a male of this species were taken from the mouth of *Antimora viola* by the Bureau of Fisheries steamer *Albatross* in 1883 in the middle Atlantic south of Newfoundland. The better of the adult females has received Cat. No. 43540, U.S.N.M. and is made the species type; the others become paratypes and have been given Cat. No. 8341, U.S.N.M.

*Specific characters of female.*—Cephalothorax short, stocky, and cylindrical, not flattened; head enlarged a little and covered with a dorsal carapace; neck separated from the trunk dorsally by a well-defined groove; trunk ovate and smooth, without ridges or pits; two small posterior processes, close together on the ventral surface and about one-third as long as the egg strings; no genital process; egg strings stout and a little longer than the trunk; eggs small, arranged in twelve longitudinal rows, about 30 eggs in the longest rows. First antennae three-jointed and tapered regularly from base to tip; second antennae biramose and turned down squarely across the frontal margin, the exopod (ventral) very small and two-jointed. Mouth-tube wide and long, reaching the tips of the second antennae. First maxillae three-partite, the outer ramus much smaller than the others, the palp slender and tipped with a single seta. Second maxillae short and stocky, entirely separate to the tips in the young female, but more or less fused in the adults; bulla button-shaped.

Maxillipeds large and standing out prominently from the head, terminal claw stout, but only half the length of the basal joint, with an accessory claw on the inner margin.

Color (preserved material), a brownish-yellow.

Cephalothorax, 4.5 mm. long, 1 mm. wide. Trunk, 5 mm. long, without the posterior processes, 3.25 mm. wide, 3 mm. thick. Egg strings, 6. mm. long, 1.40 mm. in diameter.

*Specific characters of male.*—Cephalothorax at an angle of 45° with the axis of the trunk; head covered with a dorsal carapace; waist only a groove dorsally; trunk spindle-shaped and curved so that the conical anal laminae point ventrally.

First antennae slender and three-jointed; endopod of second pair bent over backward nearly at right angles, exopod ending in a chela. First maxillae like those of the female; second maxillae slender and very much longer than the maxillipeds; the latter triangular and rather small, but armed with a powerful claw.

Color (preserved material), yellowish-white.

Total length, 1.15 mm. Greatest diameter, 0.5 mm.

(*pinguis*, stocky or plump.)

*Remarks.*—This new species from one of the deep-water fishes may be recognized by its generally plump appearance, by the well defined dorsal carapace of the female, and by the two long and slender ventral processes. The peculiar characters in the male are the short and plump body, the small carapace, and the folding of the endopod of the second antennae.

### BRACHIELLA NITIDA, new species.

Plate 56, figs. 246 to 248.

*Host and record of specimens.*—A single adult female with egg strings was obtained by the Bureau of Fisheries steamer *Albatross* from the mouth of *Albatrossia pectoralis,* at station 5015 in the northern Pacific in 1906. The specimen was perfectly preserved and easily determined to be a new species; it becomes the species type and has received Cat. No. 43584, U.S.N.M.

*Specific characters of female.*—Cephalothorax slender, flattened dorso-ventrally, and as long as the trunk; head enlarged and covered with a dorsal carapace; neck grooved in several places as though jointed; trunk a flattened sphere, with a smooth and evenly curved surface; two short posterior processes, close together on the ventral surface, and two-fifths as long as the trunk; egg strings over twice the length of the trunk and stout; eggs in 10 or 12 longitudinal rows, about 45 in the longest rows; no genital process. First antennae three-jointed, the basal joint much enlarged; second antennae biramose and turned down squarely across the frontal margin, the exopod two-jointed and reaching the tip of the endopod. Mouth tube short and narrow at the tip, not reaching the second antennae. First maxillae tripartite, the palp short and armed with a single seta.

Second maxillae slender, longer than the cephalothorax, and separate for their entire length; bulla small and mushroom-shaped.

Maxillipeds some distance behind the mouth-tube, rather slender, but standing out prominently from the head, with a short terminal claw, whose inner margin carries a series of minute teeth.

Color (preserved material), white.

Cephalothorax, 4 mm. long, 0.5 mm. wide. Trunk, 3.80 mm. long, 3.75 mm. wide, 2.5 mm. thick. Egg strings, 8 mm. long, 1 mm. in diameter.

(*nitidus*, dapper, neat.)

*Male.*—Unknown.

*Remarks.*—This is a peculiarly neat and clean looking species and may be recognized by the prominent maxillipeds, by the long and slender second maxillae, and by the exceptionally long egg strings. In the second antennae also there is a great difference in size between the two rami.

### BRACHIELLA APPENDICULOSA (Krøyer).

*Anchorella appendiculosa* Krøyer, 1863, p. 306, pl. 16, fig. 6, *a* to *c*.

*Host and record of specimens.*—Krøyer took a single specimen of this species in April, 1853, at New Orleans, Louisiana, from the gills of a fish, "a *Corvina* or possibly a *Pagellus*, because I have no certain recollection of it and made no written notes."

*Specific characters of female.*—Cephalothorax longer than the trunk and made up of two parts, an elongated head covered with a brown carapace, and a thick, wrinkled neck; trunk thick and broad, obcordate in outline; four cylindrical posterior processes, the dorsal pair somewhat smaller than the ventral and farther apart, the ventral pair nearer together and longer than the trunk; genital process short and nearer the dorsal surface; egg strings large and a little longer than the processes.

Second antennae biramose, turned down across the frontal margin, the posterior or ventral ramus a little smaller and apparantly three-jointed. First antennae close to the mouth-tube near its base, two-jointed, the joints standing almost at a right angle to each other. Second maxillae three-fifths as long as the cephalothorax, situated at the posterior end of the neck, close to the trunk. Each maxilla is broad at the base and pointed toward the tip, where it is attached to a small, spherical bulla.

Maxillipeds large and prominent, the basal joint armed on the inner margin with roughened knobs and spines, the terminal claw with an accessory spine on the inner margin near the base.

Color, milk-white.

Total length, 8.75 mm. Cephalothorax, 4.85 mm. long. Trunk, 3.90 mm. long. Posterior processes, 4.25 mm. long.

(*appendiculosa*, with many small appendages).

*Remarks.*—This species has never been seen by any investigator other than Krøyer, but his description and figures are sufficient to establish the validity of the species, and since it was obtained at New Orleans it must be included in our North American forms.

There is good hope that it may be rediscovered when the fish of that locality are more carefully examined.

### BRACHIELLA GRACILIS Wilson.

*Brachiella gracilis* Wilson, 1908, p. 464, pl. 77.

*Host and record of specimens.*—Both sexes and several developmental stages were taken by Dr. J. F. McClendon from the mouth of the white sea bass, *Cynoscion nobilis*, at La Jolla, California.

These were made the types of the species and were given Cat. No. 38577, U.S.N.M.

*Remarks.*—This species was fully described and figured in the reference given above. It may be recognized by the length and slenderness of the second maxillipeds, by the fact that they are held together for their entire length without being actually fused, and by the long genital process.

## PARABRACHIELLA, new genus.

*Generic characters of female.*—Of large size (14 to 17 mm. long); cephalothorax of medium length and separated from the trunk by a well-defined groove, cylindrical and flexuose; a more or less distinct carapace on the head; trunk also cylindrical, somewhat flattened dorso-ventrally, without pits or grooves; one or two pairs of posterior processes and a minute genital process.

First antennae four-jointed; second antennae biramose, the exopod with two segments; first maxillae bipartite, the palp with two tiny spines; second maxillae united only at the tips; maxillipeds of the usual form, the terminal claw with two accessory spines on the inner margin.

*Generic characters of male.*—Head at right angles with the rest of the body, but so thoroughly fused as to show no trace of separation or segmentation; no dorsal carapace; body strongly inflated, the dorsal surface a semicircle, the ventral surface nearly straight, tapering posteriorly and terminating in two small anal laminae at right angles to the body axis.

First antennae three-jointed; second antennae biramose, the rami reduced to mere knobs; first maxillae tripartite; second maxillae and maxillipeds relatively very small, close together, and removed a little from the base of the mouth tube.

*Type.—Parabrachiella rostrata* (*Brachiella rostrata* Krøyer).

(*Parabrachiella*, *Παρα*, near and *Brachiella*.)

*Remarks.*—This genus includes at present only two species, *rostrata*, originally described by Krøyer in 1837 from halibut taken at Kattegat, and *insidiosa*, described by Heller in 1865 from a *Gadus* species in the Mediterranean. The former has been noted by numerous writers as found on the halibut along the coasts of Scandinavia, Scotland, and eastern North America. The latter has also been found in various portions of the Mediterranean and around the British Isles, chiefly upon hake, *Merluccius vulgaris*.

The female of the genus may be recognized by its large size, by the groove between the cephalothorax and trunk, by the absence of pits and grooves, and by the short posterior processes.

The male is distinguished by the angulation of the head, and by the fact that the body is neither segmented nor constricted.

### TABLE OF SPECIES.

1. Only one pair of posterior processes................*rostrata* (Krøyer), 1837, p. 714.
1. Two pairs of posterior processes..........................*insidiosa* (Heller), 1865.

### PARABRACHIELLA ROSTRATA (Krøyer).

Plate 28, fig. O; plate 56, figs. 249 to 255.

*Brachiella rostrata* KRØYER, 1837, p. 207, pl. 2, fig. 1.—T. SCOTT, 1900, p. 174, pl. 8, figs. 38 and 39.

*Host and record of specimens.*—The United States National Museum collection includes two lots of this species; the first, three females, was taken from halibut near Shetland and was sent by Rev. A. M. Norman, of England, in 1884; they bear Cat. No. 8343, U.S.N.M. The second lot of four adult females with egg strings was obtained from halibut on the Georges Banks by a Gloucester fishing vessel in 1883, and bears Cat. No. 6212, U.S.N.M.

*Specific characters of female.*—Cephalothorax as long as the trunk, cylindrical, not flattened, and distinctly separated from the trunk by a groove behind the second maxillae; head not enlarged, but covered with a dorsal carapace which is squarely truncated anteriorly; neck about the same diameter throughout; trunk strongly flattened dorsoventrally, four times the width but only twice the thickness of the neck; two minute conical posterior processes on the ventral surface close to the midline; egg strings one-half longer than the trunk and narrow; eggs in 10 longitudinal rows, about 40 in the longest rows.

First antennae indistinctly four-jointed, with an enlarged base; second antennae biramose and turned down squarely across the frontal margin, the endopod (dorsal ramus) one-jointed with a few minute spines, the exopod (ventral ramus) two-jointed and unarmed.

First maxillae bipartite with a small palp; second maxillae cylindrical, tapering toward the tips, where they are joined by a club-shaped bulla. Maxillipeds with a stout basal joint and a slender terminal claw; the latter is arched dorsally, straight ventrally, and is reinforced on the inner margin near the tip by two secondary spines.

Color (preserved material), a brownish-yellow.

Cephalothorax, 6 mm. long, 1.25 mm. in diameter. Trunk, 6.5 mm. long, 4 mm. wide, and 2.30 mm. thick. Egg strings, 8.50 mm. long, 1.25 mm. in diameter.

*Specific characters of male.*—Axis of head at right angles to that of the body, the two thoroughly fused, strongly inflated, and without any traces of separation or segmentation; trunk convex dorsally, flattened ventrally, and tapered posteriorly where it ends in two minute anal laminae, directed diagonally backward and ventrally.

First antennae slender and three-jointed; second antennae biramose, both rami reduced to mere knobs.

First maxillae tripartite, the palp minute and ending in a single spine; second maxillae slender but no longer than the maxillipeds; the latter a little stouter and with a stronger terminal claw.

Color like that of the female.

Total length, 2 mm. Greatest diameter, 1 mm.

(*rostrata*, furnished with a rostrum or beak.)

*Remarks.*—This species is apparently common upon the halibut of the northern Atlantic wherever they are captured. It is sufficiently distinguished by the characteristics given under the genus. Attention is particularly called to the strong contrast between the males of this genus and *Brachiella* in their general bodily appearance as well as in the details of the appendages.

### EPIBRACHIELLA, new genus.

*Generic characters of female.*—Of medium size (10 mm. long); cephalothorax cylindrical and about the same length as the trunk, separated from the latter by a distinct groove; trunk strongly flattened dorso-ventrally and without pits or grooves; six short and pointed posterior processes, all about the same length; no genital process; egg strings much longer and stouter than the processes.

First antennae four-jointed, the basal joint much inflated; second antennae biramose and turned down across the frontal margin. First maxillae bipartite, the palp with two minute spines; second maxillae of varying length and branched at or near their center. Maxillipeds with a stout basal joint, armed on its inner margin with spines and setae, the terminal claw with an accessory spine and a row of saw teeth.

*Generic characters of male.*—Head and body in the same line and separated by a well-defined groove; no dorsal carapace; trunk a little wider than the cephalothorax and distinctly segmented, tapering posteriorly to two bluntly rounded anal laminae.

Second maxillae larger than the maxillipeds, the two attached to the center of the cephalothorax, close behind the other mouth parts; no data with reference to the antennae or maxillae.

*Type.*—*Epibrachiella impudica* (*Brachiella impudica* Nordmann.)

(*Epibrachiella*, ἐπί close to, and *Brachiella*.)

*Remarks.*—At present this genus includes but the single species *impudica*, which was well described and figured by Nordmann in 1832.

Since then it has been noticed by various other investigators up to 1899 when Bassett-Smith tried to change the species from the genus *Brachiella* to *Thysanote*. In this he was followed by T. and A. Scott (1900, 1902, 1904, and 1913). But if we compare the females we find in the present genus a total absence of the fimbriate processes, which are the chief characteristics of *Thysanote*, a very different cephalothorax, and numerous distinctions in the detail of the antennae and mouth parts. The males are even more unlike than the females in the separation of the cephalothorax and trunk and in the segmentation of the latter (see pl. 26, fig. F.).

## PROBRACHIELLA, new genus.

*Generic characters of female.*—Cephalothorax nearly in line with the trunk and arched; head covered with a dorsal carapace; trunk subquadrilateral, a little narrowed anteriorly, separated from the cephalothorax by a well-defined groove; four pairs of posterior processes, one pair at the ventral, another at the dorsal, posterior corners, a third pair partly fused on the dorsal midline, and a fourth pair just outside the third and fused with them at their base; no abdomen, anal laminae, or genital process; egg strings short and spherical. First antennae indistinctly three-jointed; second antennae a flattened lamella, biramose at the tip but with the rami unsegmented and unarmed. First maxillae tripartite, without a palp; second maxillae very short and completely fused; maxillipeds with swollen basal joints and weak terminal claws.

*Generic characters of male.*—Cephalothorax at right angles to the trunk axis and separated from the trunk by a slight constriction; no dorsal carapace; trunk cone-shaped, somewhat flattened ventrally; no anal laminae. First antennae three-jointed; second antennae uniramose, indistinctly segmented, tipped with a claw and a corrugated knob. First maxillae like those of the female; second maxillae and maxillipeds about the same size and armed with powerful chelate claws (see pl. 28, fig. R.).

*Type.*—*Probrachiella anserina* (*Brachiella anserina* Wilson).

(*Probrachiella*, the prefix *Πρό* and *Brachiella*.)

*Remarks.*—The female is readily distinguished by the eight posterior processes and the spherical egg strings, neither character being found anywhere else in the entire family. In the male the turning of the cephalothorax at right angles to the trunk axis, and the general squat appearance of the body, the uniramose second antennae, and the chelate second maxillae and maxillipeds are the chief characteristics. This is an arctic species and may be far more common than the single lot of specimens would indicate. The fish around Bering Straits have hardly been examined at all for parasites; when they are, it is possible that this species will be found more abundantly.

When first described[1] this species was placed in the genus *Brachiella*, but when the characters of that genus were definitely established this species differed in so many particulars that it was necessary to establish a new genus for it. At present the generic and specific characters are the same.

## EUBRACHIELLA, new genus.

*Generic characters of female.*—Cephalothorax about the same length as the trunk, inclined a little forward or nearly in the same line; no dorsal carapace; trunk stout and short and separated from the cephalothorax by a distinct groove; no abdomen, anal laminae, or posterior processes; genital process so rudimentary as to be scarcely visible; egg strings cylindrical and plump.

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[1] Proc. U. S. Nat. Mus., vol. 35, p. 467.

First antennae three-jointed; second antennae biramose, both rami unsegmented, and unarmed. First maxillae tripartite, the palp with one spine; second maxillae short and stout, entirely separate and each maxilla attached separately to the host, or to a common bulla. Maxillipeds with a swollen basal joint, which is unarmed, and a slender terminal claw.

*Generic characters of male.*—Cephalothorax longer than the trunk and the two separated by a distinct constriction; head covered with a dorsal carapace; trunk bent in a half circle so that the posterior end points toward the head; no anal laminae or traces of segmentation. First antennae three-jointed; second antennae uniramose, tipped with a curved claw. First maxillae bipartite, without a palp; second maxillae a little larger than the maxillipeds, both tipped with stout claws. (See pl. 28, fig. P.)

*Type.*—*Eubrachiella antarctica* (*Brachiella antarctica* Quidor).

(*Eubrachiella*, *Eŭ* and *Brachiella*.)

*Remarks.*—This genus is distinguished by the fact that the female has no posterior processes, the rami of the second antennae are unsegmented, and the second maxillae are either entirely separate or are separately attached to a common bulla. The male differs even more, and shows a condition about half way between a typical *Brachiella* male and that found in the genus *Clavella* and its near relatives. The body has been folded upon itself until the posterior end of the trunk points as directly forward as in *Clavellodes*, but there has been no fusion, and the trunk is clearly differentiated from the cephalothorax; and according to Quidor the second antennae are uniramose and terminate in a prehensile claw. The genus includes two species, both obtained in the antarctic by the French expeditions under the command of Jean Charcot.

### TABLE OF SPECIES.

1. Trunk quadrilateral, first maxillae tripartite.............*antarctica* (Quidor), 1906.
1. Trunk obcordate, first maxillae bipartite...................*gaini* (Quidor), 1912.

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## EXPLANATION OF PLATES.

### Plate 25.

Male genus types.

Fig. A. *Achtheres ambloplitis*. Fig. B. *Lernaeopoda bidiscalis* (after Kane). Fig. C. *Brachiella thynni*. Fig. D. *Lernaeopodina relata*.

### Plate 26.

Male genus types.

Fig. E. *Clavellisa cordata*. Fig. F. *Epibrachiella impudica* (after Nordmann). Fig. G. *Thysanote longimana*. Fig. H. *Thysanotella multifimbriata* (after Bassett-Smith). Fig. I. *Charopinus dentatus*.

### Plate 27.

Male genus types.

Fig. J. *Naobranchia lizae*. Fig. K. *Clavellopsis laciniata*. Fig. L. *Clavellodes rugosa* Fig. M. *Clavella uncinata*.

### Plate 28.

Male genus types.

Fig. N. *Vanbenedenia krøyeri* (after Olsson). Fig. O. *Parabrachiella rostrata*. Fig. P. *Eubrachiella antarctica* (after Quidor). Fig. R. *Probrachiella anserina*.

### Plate 29.

Females of *Salmincola californiensis* and *S. salmonea*.

Fig. 16, dorsal view, *S. californiensis* (after Dana). Fig. 17, side view. Fig. 18, side view, *S. salmonea*. Fig. 19, dorsal view of head. Fig. 20, side view, showing first ($a^1$) and second ($a^2$) antennae, and first maxilla ($mx^1$). Fig. 21, maxilliped. Fig. 22, genital process enlarged, showing spermatophores ($s$) in position. Fig. 22*a*, first antenna. Fig. 22*b*, second antenna. Fig. 22*c*, mandible. Fig. 22*d*, first maxilla.

### Plate 30.

Females of *Salmincola siscowet* and *S. edwardsii*.

Fig. 23, side view, *S. siscowet*. Fig. 24, dorsal view of head. Fig. 25, second antenna. Fig. 26, mandible. Fig. 27, first maxilla. Fig. 28, maxilliped. Fig. 29, papilla of maxilliped enlarged. Fig. 30, side view, *S. edwardsii*. Fig. 31, dorsal view of head. Fig. 32, second antenna. Fig. 33, mandible. Fig. 34, first maxilla. Fig. 35, maxilliped.

### PLATE 31.

Females of *Salmincola oquassa*, *S. bicauliculata* and *S. falculata*.

Fig. 36, side view, *S. oquassa*. Fig. 37, dorsal view of head. Fig. 38, second antenna. Fig. 39, first maxilla. Fig. 40, maxilliped. Fig. 41, side view, *S. bicauliculata*. Fig. 42, dorsal view of head. Fig. 43, side view, *S. falculata*. Fig. 44, dorsal view of head (inverted).

### PLATE 32.

Females of *Salmincola thymalli*, *S. inermis*, and *S. beani*.

Fig. 45, side view, *S. thymalli*. Fig. 46, dorsal view of head. Fig. 47, side view, *S. inermis*. Fig. 48, dorsal view of head. Fig. 49, first antenna. Fig. 50, second antenna. Fig. 51, first maxilla. Fig. 52, side view, *S. beani*. Fig. 53, dorsal view of head.

### PLATE 33.

Females of *Salmincola carpenteri* and *S. gibber*.

Fig. 54, side view, *S. carpenteri*. Fig. 55, dorsal view of head. Fig. 56, second antenna. Fig. 57, mandible. Fig. 58, first maxilla. Fig. 59, maxilliped. Fig. 60, side view, young female, showing genital process. Fig. 61, side view, *S. gibber*. Fig. 62, dorsal view of head.

### PLATE 34.

Females of *Achtheres corpulentus* and *A. micropteri*.

Fig. 63, dorsal view, *A. corpulentus* (after Kellicott). Fig. 64, dorsal view, *A. micropteri*. Fig. 65, ventral view of antennae and mouth parts; $a^1$ and $a^2$, first and second antennae; *mx*, first maxilla; *mxp*, maxilliped. Fig. 66, first antenna, enlarged. Fig. 67, mandible.

### PLATE 35.

Females of *Achtheres micropteri* and *A. lacae*.

Fig. 68, side view, *A. micropteri*. Fig. 69, dorsal view of head. Fig. 70, side view, *A. lacae*. Fig. 71, dorsal view of head. Fig. 72, mouth tube, first and second antennae and first maxilla. Fig. 73, second antenna, side view. Fig. 74, maxilliped.

### PLATE 36.

Female of *Achtheres coregoni* and male of *A. amblopitis*.

Fig. 75, side view, *A. coregoni*. Fig. 76, dorsal view of head. Fig. 77, side view of antennae and mouth parts, enlarged. Fig. 78, second antenna. Fig. 79, maxilliped. Fig. 80, ventral view of posterior trunk, showing small abdomen. Fig. 81, side view, *A. amblopitis*. Fig. 82, first and second antennae and mouth tube. Fig. 83, second antennae from inner side. Fig. 84, first maxilla. Fig. 85, maxillipeds.

### PLATE 37.

Female of *Achtheres amblopitis*.

Fig. 86, dorsal view. Fig. 87, side view. Fig. 88, dorsal view of head. Fig. 89, ventral view of antennae and mouth parts. Fig. 90, mandible. Fig. 91, bulla.

### PLATE 38.

Female of *Achtheres pimelodi*.

Fig. 92, dorsal view. Fig. 93, side view. Fig. 94, dorsal view of head. Fig. 95, antennae and mouth parts, lettering as in fig. 65.

### Female of *Achtheres percarum* and males of *Lernaeopoda elongata* and *Lernaeopodina relata.*

Fig. 96, side view, *A. percarum.* Fig. 97, dorsal view of head. Fig. 98, side view, young male, *L. elongata.* Fig. 99, side view, *L. relata.* Fig. 100, second maxilla. Fig. 101, maxilliped.

## PLATE 40.

### Male and female of *Lernaeopodina relata* and female of *Tracheliastes grandis.*

Fig. 102, side view of mouth parts and antennae, *L. relata*, male. Fig. 103, side view of female. Fig. 104, ventral view of antennae and mouth parts. Fig. 105, maxilliped. Fig. 106, ventral view, *T. grandis.* Fig. 107, side view of antennae and mouth tube. Fig. 108, maxilliped

## PLATE 41.

### Females of *Brianella corniger*, and *Charopinus bicaudatus.*

Fig. 109, side view, *B. corniger.* Fig. 110, front view of head; $an^1$ and $an^2$ first and second antennae. Fig. 111, side view of same, flattened under pressure. Fig. 112, side view, natural condition; *lb*, labium. Fig. 113, maxillipeds. Fig. 114, dorsal view of head of *C. bicaudatus.* Fig. 115, first antennae. Fig. 116, mandible. Fig. 117, first maxilla. Fig. 118, maxilliped.

## PLATE 42.

### Females of *Charopinus bicaudatus* and *Naobranchia lizae.*

Fig. 119, side view, *C. bicaudatus.* Fig. 120, ventral view of antennae and mouth-parts; $an^1$ and $an^2$, first and second antennae; $mx^1$, first maxilla. Fig. 121, median section of *N. lizae; a*, anus; *i*, intestine; $mx^2$, second maxillae; *n*, thickened cartilage around the muscle strands; *oe*, esophagus; *s*, stomach *sr*, semen receptacle; *x*, *y*, and *z*, points at which the enlarged figures 123, 126, and 133 were taken; *, point corresponding to the one in the shoulders where the maxillary glands are situated. Fig. 122, median section of head, enlarged; *fg*, frontal gland; *ig*, and *sg*, infra and supra-esophageal ganglia; *m*, mouth; *oe*, esophagus; *p*, posterior nerve; *s*, stomach. Fig. 123, section *x* of fig. 121, enlarged; *gc*, gland cells of stomach; *s*, skin; *sct*, subcutaneous tissue. Fig. 124, section of second maxillae; *m*, muscle bands; *o*, open spaces connecting the muscle bands; *s*, skin.

## PLATE 43.

### Female of *Naobranchia lizae.*

Fig. 125, maxillary gland. Fig. 126, section *z* of fig. 121, enlarged. Fig. 127, side view of adult. Fig. 128, side view of young, showing maxillae freed at their tips. Fig. 129, side view of head, showing the peculiar lateral appendages. Fig. 130, second antennae. Fig. 131, ventral view of fused trunk and abdomen. Fig. 132, dorsal view.

## PLATE 44.

### Female and male of *Naobranchia occidentalis.*

Fig. 133, section *y* of fig. 121, enlarged. Fig. 134, section of egg, showing blastoderm disk and large central vacuoles. Fig. 135, ventral view of antennae and mouth parts of *N. lizae.* Fig. 136, dorsal view, *N. occidentalis.* Fig. 137, ventral view of antennae and mouth parts. Fig. 138, ventral view of head, showing peculiar lateral appendages. Fig. 139, side view of male.

### PLATE 45.

Female and male of *Clavella perfida*, and female of *C. tumida*.

Fig. 140, side view, *C. perfida*, female. Fig. 141, ventral view, showing genital process and maxillary glands. Fig. 142, ventral view of antennae and mouth parts. Fig. 143, side view of male. Fig. 144, side view, *C. tumida*. Fig. 145, ventral view of antennae and mouth parts. Fig. 146, first maxilla. Fig. 147, maxilliped of male.

### PLATE 46.

Male of *Clavella tumida*, female and male of *C. canaliculata*, and female of *C. insolita*.

Fig. 148, side view, male *C. tumida*. Fig. 149, side view, female *C. canaliculata*. Fig. 150, ventral view of antennae and mouth parts. Fig. 151, side view of male. Fig. 152, ventral view of *C. insolita*. Fig. 153, antennae and mouth parts, $an'$ and $an^2$, first and second antennae; $mx'$, first maxilla; $mxp$, maxilliped.

### PLATE 47.

Female of *Clavella levis*, and female and male of *Clavella pinguis*.

Fig. 154, side view, *C. levis*. Fig. 155, antennae and mouth parts. Fig. 156, side view of adult female of *C. pinguis*. Fig. 157, side view of young female. Fig. 158, antennae and mouth parts. Fig. 159, second maxillae showing line of separation. Fig. 160, side view of male. Fig. 161, antennae and first maxilla, enlarged.

### PLATE 48.

Female of *Clavella squamigera*, and female and male of *Clavella uncinata*.

Fig. 162, side view, *C. squamigera*. Fig. 163, ventral view, showing scales around second maxillae. Fig. 164, antennae and mouth parts. Fig. 165, second antennae. Fig. 166, maxilliped. Fig. 167, first antenna and first maxilla of female *C. uncinata*. Fig. 168, maxilliped. Fig. 169, section through the center of the bulla. Fig. 170, side view of male. Fig. 171, first and second antennae of male. Fig. 172, first maxilla. Fig. 173, maxilliped.

### PLATE 49.

Female of *Clavella uncinata*, female and male of *C. irina*, and female of *Clavellopsis robusta*.

Fig. 174, antennae and mouth parts of *C. uncinata*. Fig. 175, mandible. Fig. 176, claw of maxilliped (last two figures by R. Rathbun). Fig. 177, side view of female of *C. irina*. Fig. 178, antennae and mouth parts. Fig. 179, ventral view of posterior trunk, showing genital process and peculiar fleur-de-lis. Fig. 180, side view of male. Fig. 181, second antenna. Fig. 182, dorsal view of *C. robusta*, showing short posterior processes.

### PLATE 50.

Females of *Clavella recta* and *Clavellopsis producta*, and female and male of *Clavellisa spinosa*.

Fig. 183, side view, *C. recta*. Fig. 184, antennae and mouth parts. Fig. 185, side view, *C. producta*. Fig. 186, antennae and mouth parts. Fig. 187, cell filament and egg of *Clavellisa cordata*. Fig. 188, antennae and mouth parts of *C. spinosa*. Fig. 189, side view of male.

### PLATE 51.

Female and male of *Clavellodes rugosa*.

Fig. 190, ventral view of cephalothorax and dorsal view of trunk. Fig. 191, dorsal view of head. Fig. 192, ventral view. Fig. 193, first antenna. Fig. 194, second pedal gland; *oe*, esophagus; *s*, stomach; *sp*, spermatozoa; *sph*, spermatophore; *stc*, spermatocyte; *stg*, spermatogonia; *t*, testis. Fig. 199, first and second antennae of male.

### Plate 52.

Female of *Clavellisa spinosa*, and female and male of *Clavellisa cordata*.

Fig. 200, ventral view of cephalothorax and dorsal view of trunk of *C. spinosa*. Fig. 201, ventral view of female of *C. cordata*. Fig. 202, side view. Fig. 203, antennae and mouth parts. Fig. 204, first antenna. Fig. 205, second antenna. Fig. 206, mandible. Fig. 207, maxilliped. Fig. 208, side view of male.

### Plate 53.

Female and male of *Brachiella thynni* and of *B. gulosa*.

Fig. 209, side view, *B. thynni*. Fig. 210, dorsal view of trunk. Fig. 211, second antennae and first maxillae. Fig. 212, second antenna, enlarged. Fig. 213, maxilliped. Fig. 214, side view of male. Fig. 215, antennae and first maxillae. Fig. 216, posterior trunk of *B. gulosa*, showing genital process. Fig. 217, first maxilla. Fig. 218, maxilliped. Fig. 219, side view of male. Fig. 220, first and second antennae, after sketch by M. T. Thompson.

### Plate 54.

Females of *Brachiella gulosa* and *B. mitrata*, and female and male of *B. elegans*.

Fig. 221, side view, *B. gulosa*. Fig. 222, antennae and mouth parts. Fig. 223, second antenna, enlarged (from M. T. Thompson). Fig. 224, mandible. Fig. 225, antennae and mouth parts of *B. mitrata*. Fig. 226, first antenna of *B. elegans*, female. Fig. 227, second antenna, both antennae by M. T. Thompson. Fig. 228, first maxilla. Fig. 229, maxilliped. Fig. 230, side view of male of *B. elegans*. Fig. 231, first and second antennae by M. T. Thompson. Fig. 232, first maxilla. Fig. 233, claw of second maxilla.

### Plate 55.

Females of *Brachiella elegans* and *B. mitrata*, and female and male of *B. pinguis*.

Fig. 234, side view, *B. elegans*. Fig. 235, side view, *B. mitrata*. Fig. 236, first antenna. Fig. 237, first maxilla. Fig. 238, maxilliped. Fig. 239, first antenna and first maxilla of *B. pinguis*. Fig. 240, second antenna. Fig. 241, maxilliped. Fig. 242, side view of male *B. pinguis*. Fig. 243, first antenna. Fig. 244, second antenna.

### Plate 56.

Females of *Brachiella pinguis*, *B. nitida*, and *Parabrachiella rostrata*.

Fig. 245, side view, *B. pinguis*. Fig. 246, side view, *B. nitida*. Fig. 247, antennae and mouth parts. Fig. 248, maxilliped. Fig. 249, side view, *P. rostrata*. Fig. 250, antennae and mouth parts, drawn by R. Rathbun. Fig. 251, second antenna. Fig. 252, mandible. Fig. 253, first maxilla. Fig. 254, second maxilla of male. Fig. 255, maxilliped of male.

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  mitrata ..........
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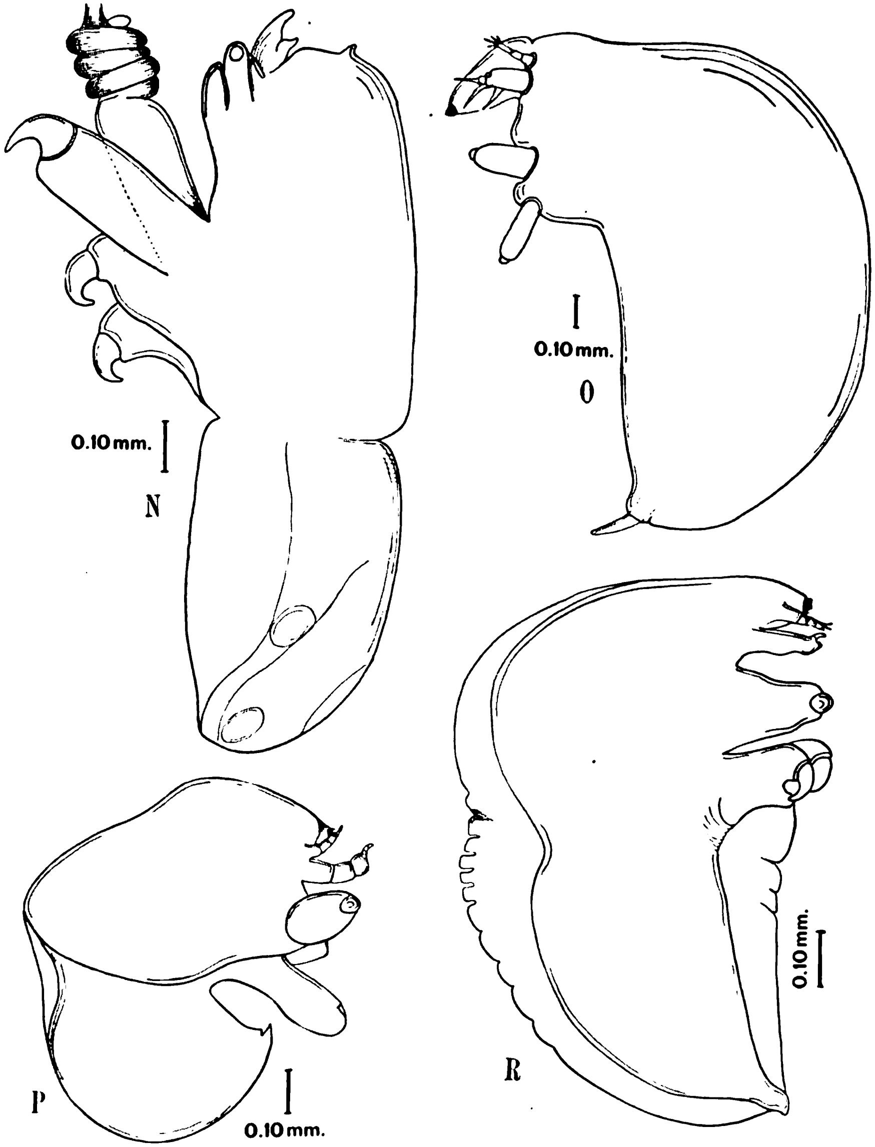
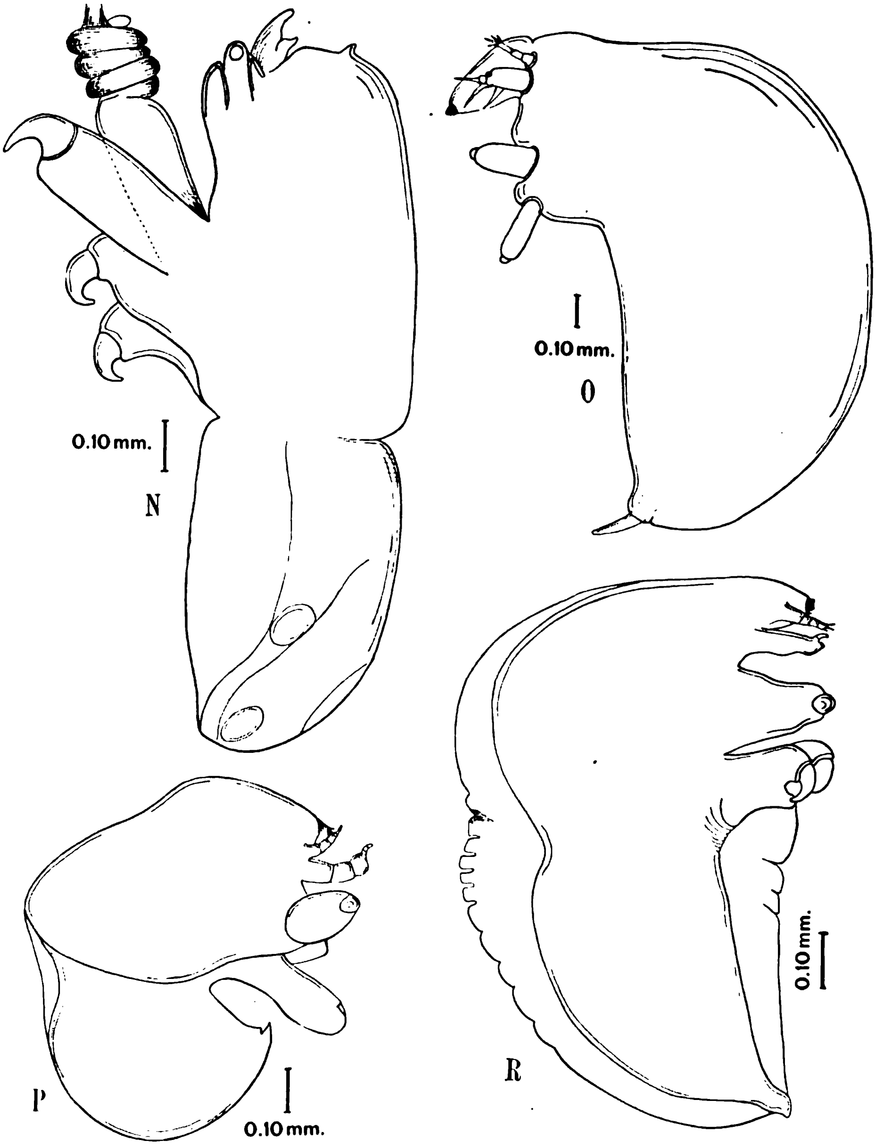


MALE GENUS TYPES.

FOR EXPLANATION OF PLATE SEE PAGE 721.



MALE GENUS TYPES.

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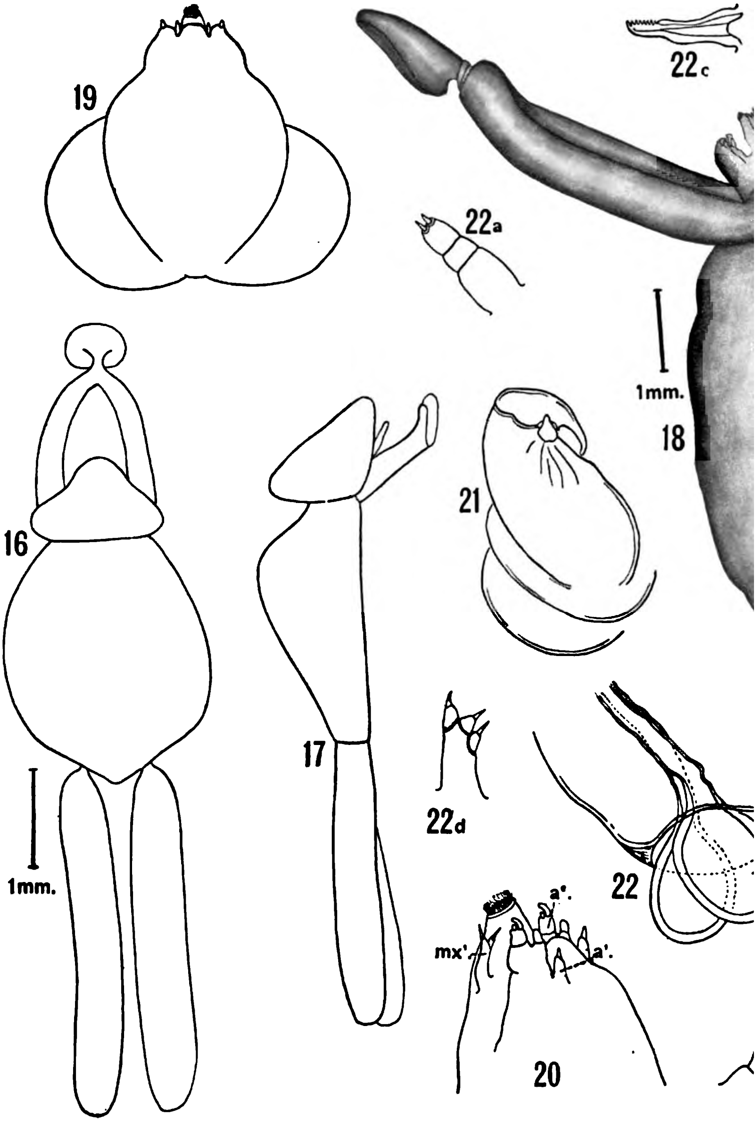
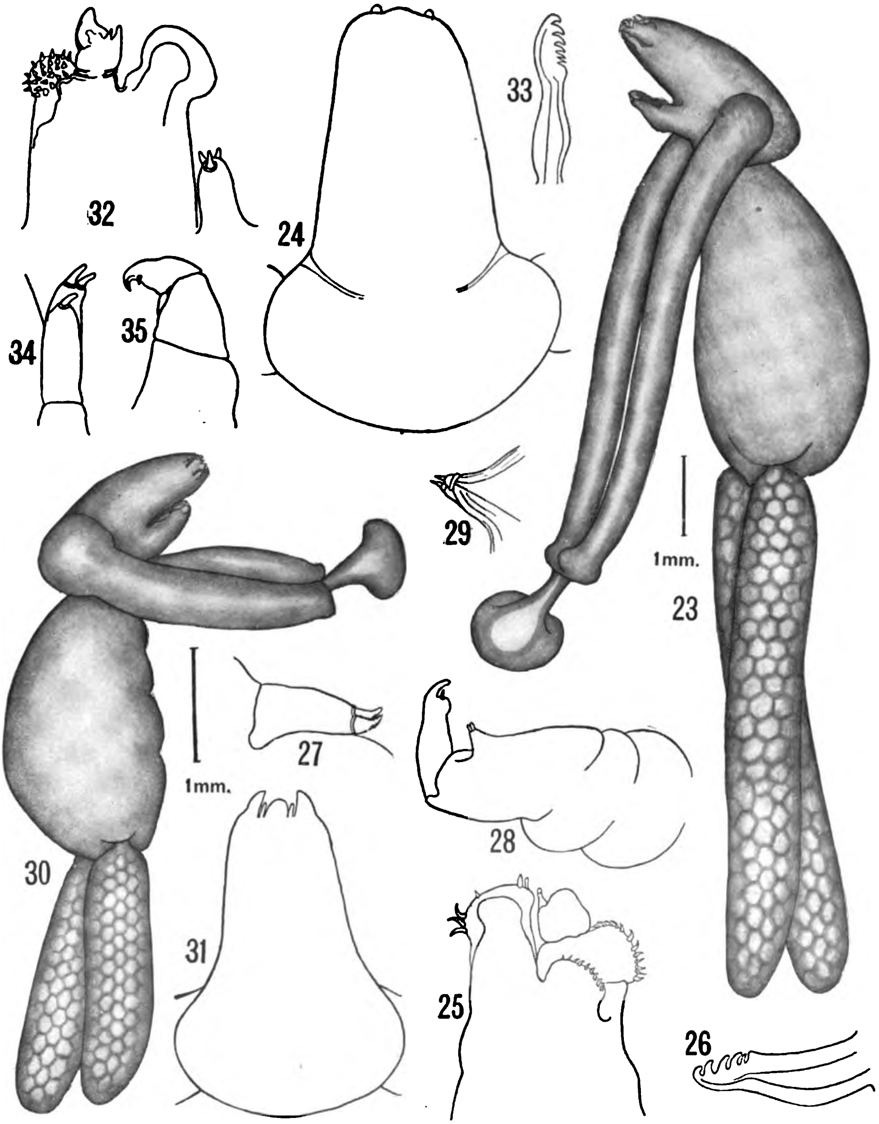


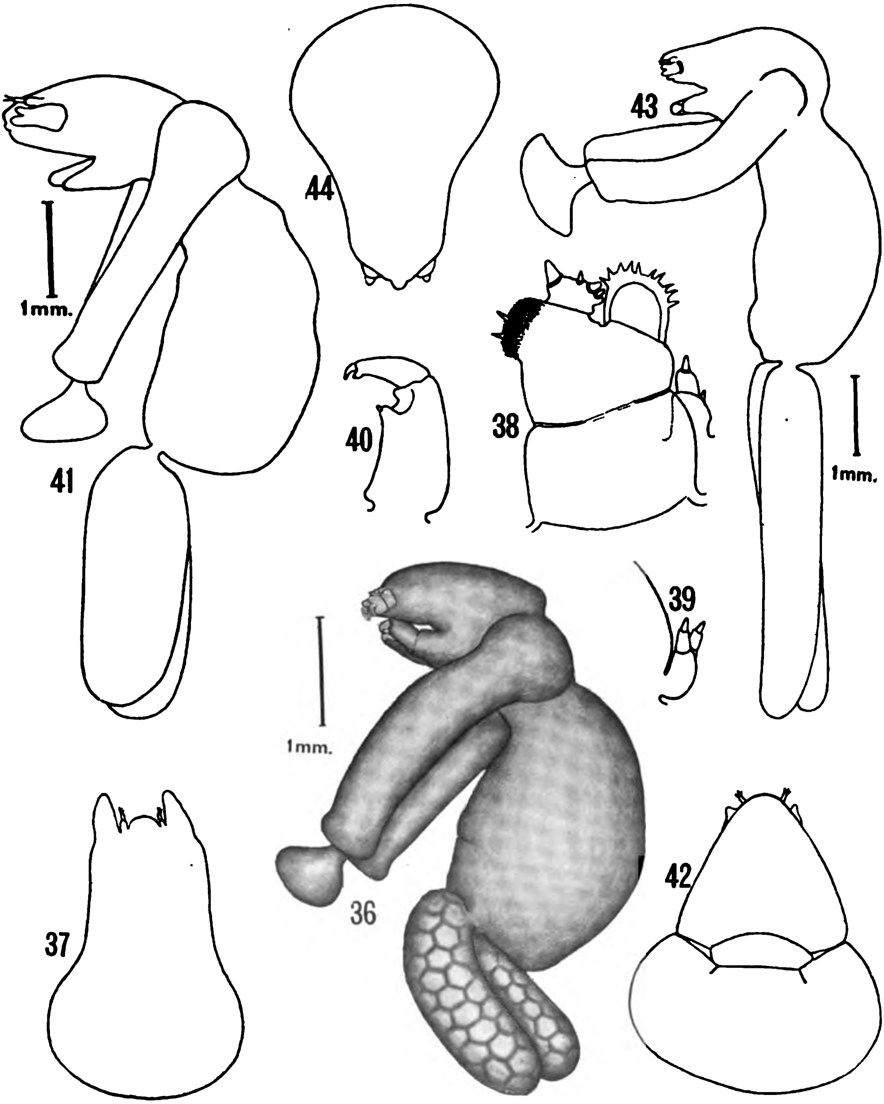
FEMALES OF SALMINCOLA CALIFORNIENSIS AND S. SALMONEA.

FOR EXPLANATION OF PLATE SEE PAGE 721.



FEMALES OF SALMINCOLA SISCOWET AND S. EDWARDSII.

FOR EXPLANATION OF PLATE SEE PAGE 721.



Females of Salmincola oquassa, S. bicauliculata, and S. fauculata.

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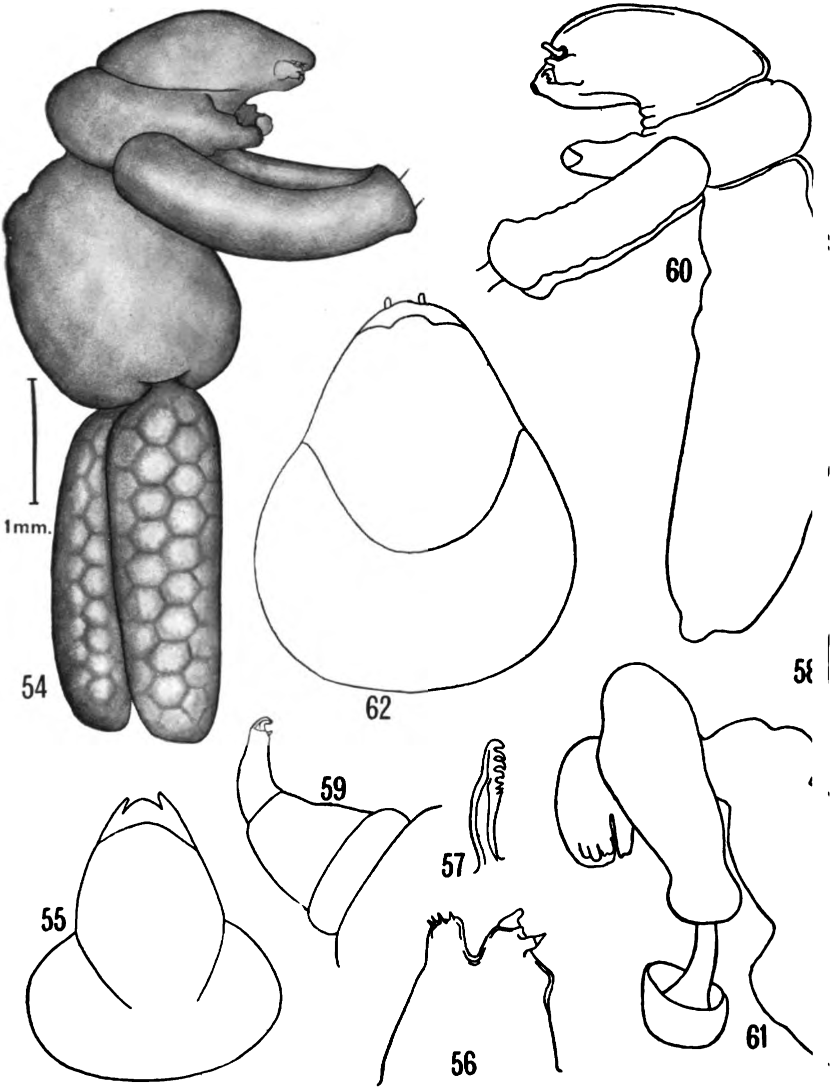

FEMALES OF SALMINCOLA CARPENTERI AND S. GIBBER.

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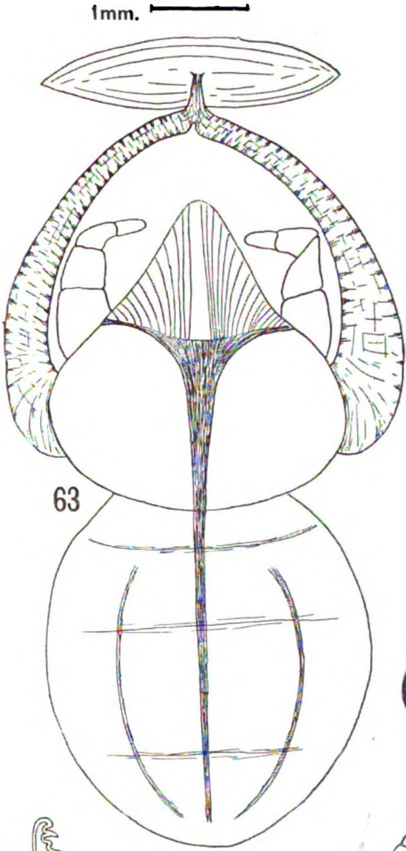

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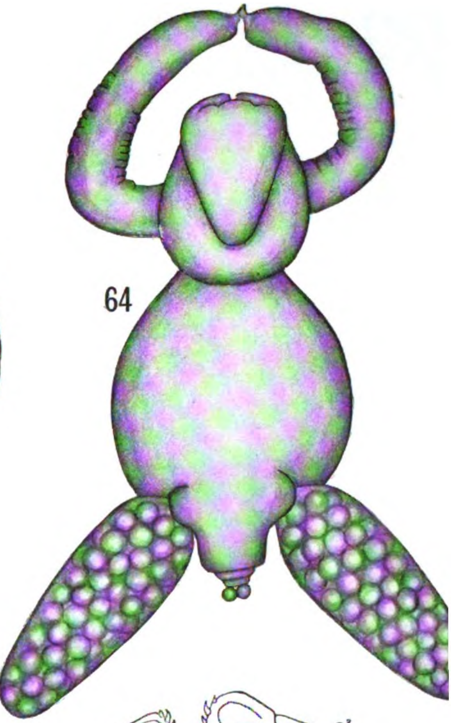

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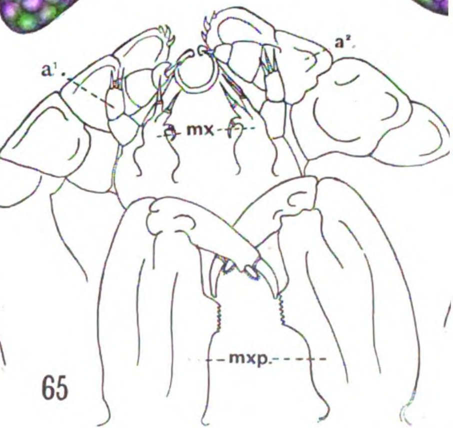

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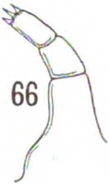

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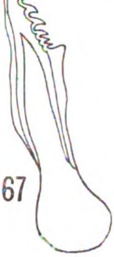

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Females of Achtheres corpulentus and A. micropteri.

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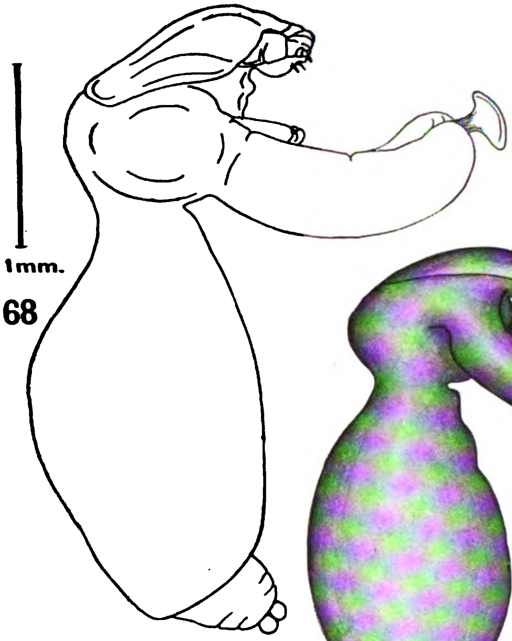

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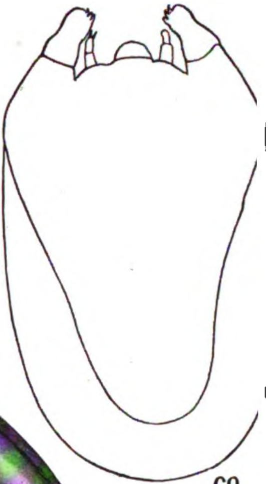

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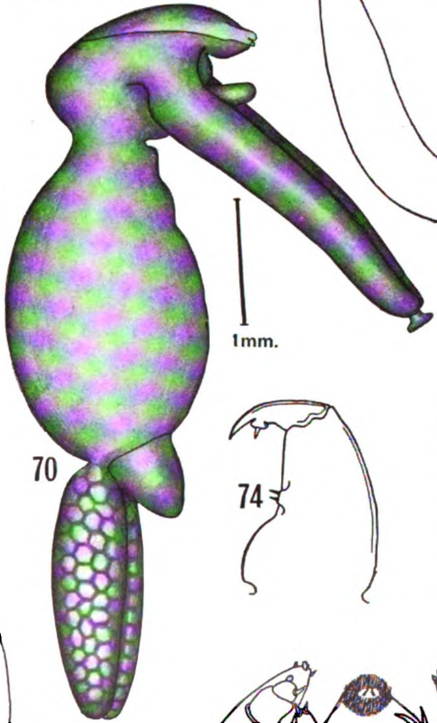

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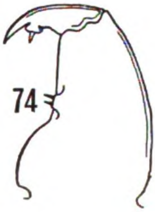

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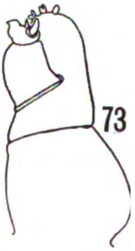

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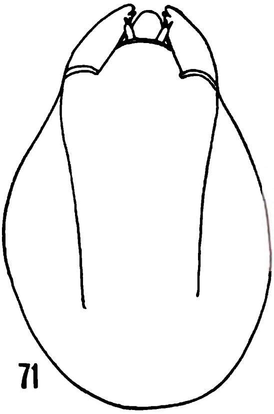

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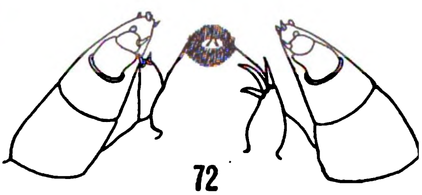

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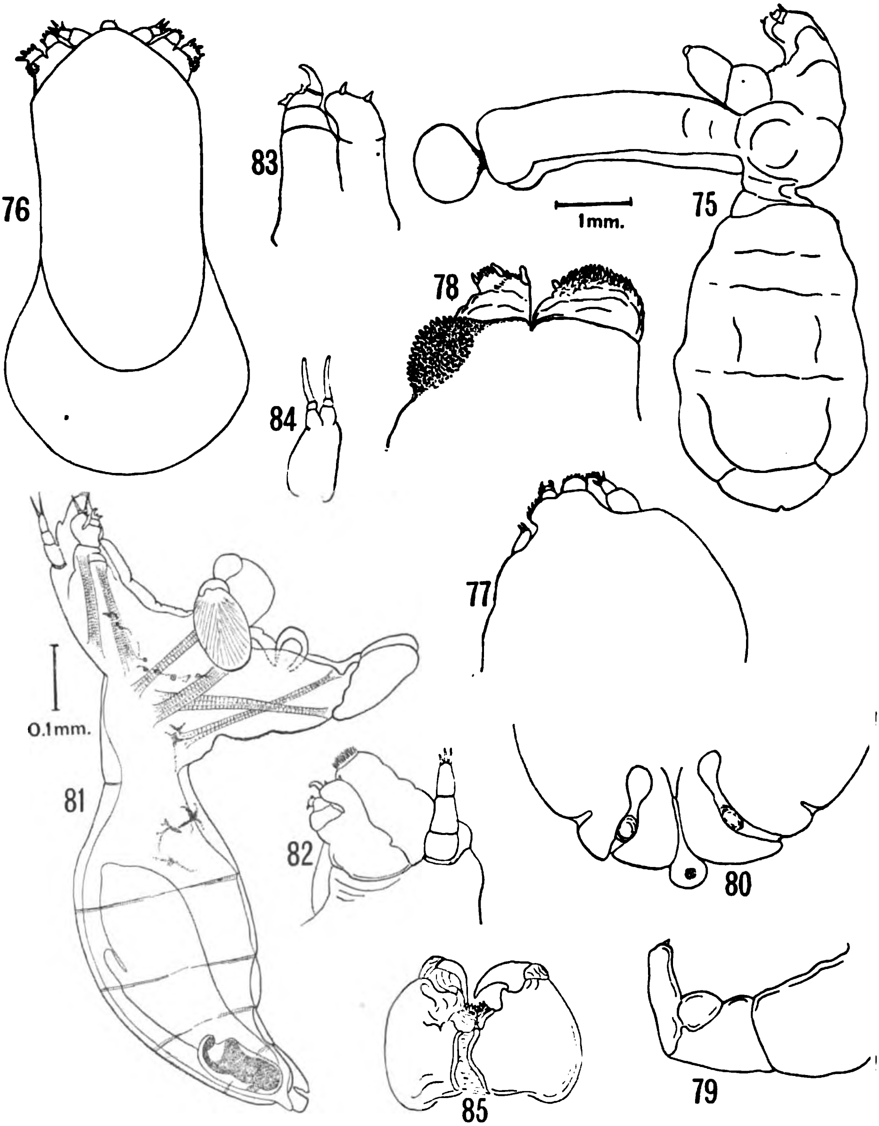
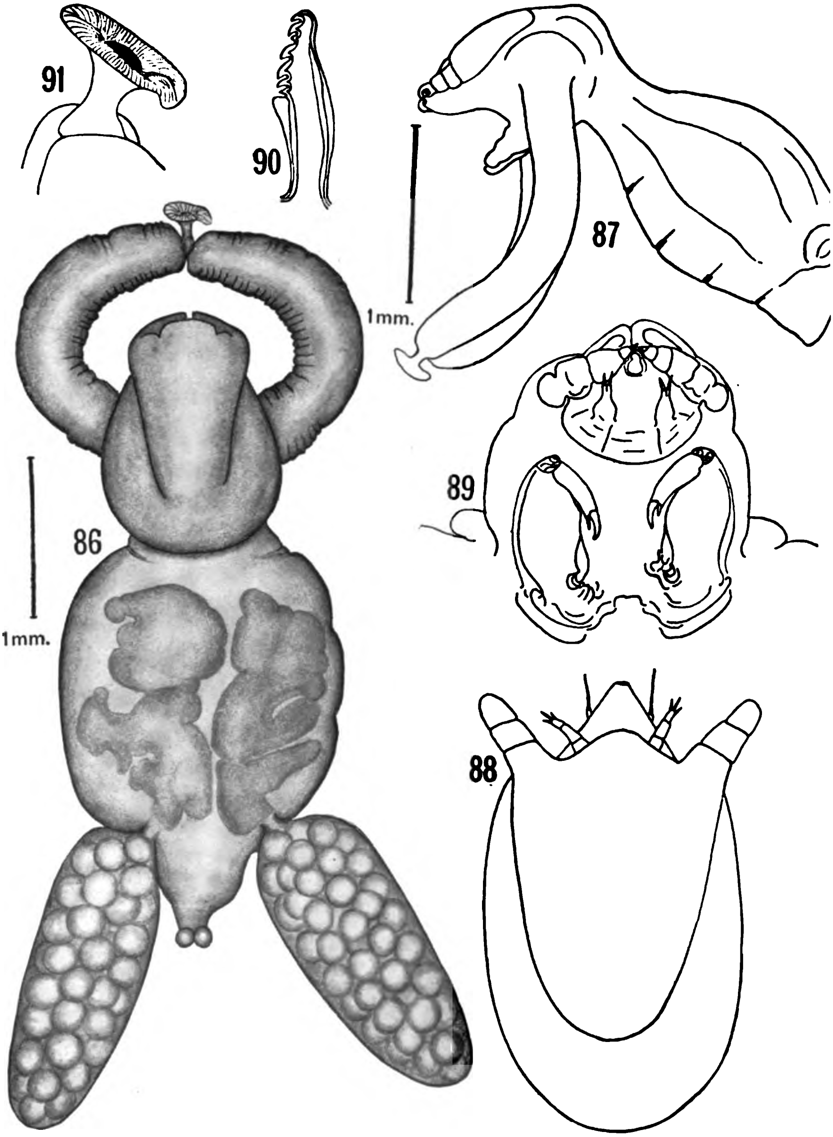
FEMALES OF ACHTHERES MICROPTERI AND A. LACAE.

FOR EXPLANATION OF PLATE SEE PAGE 722.



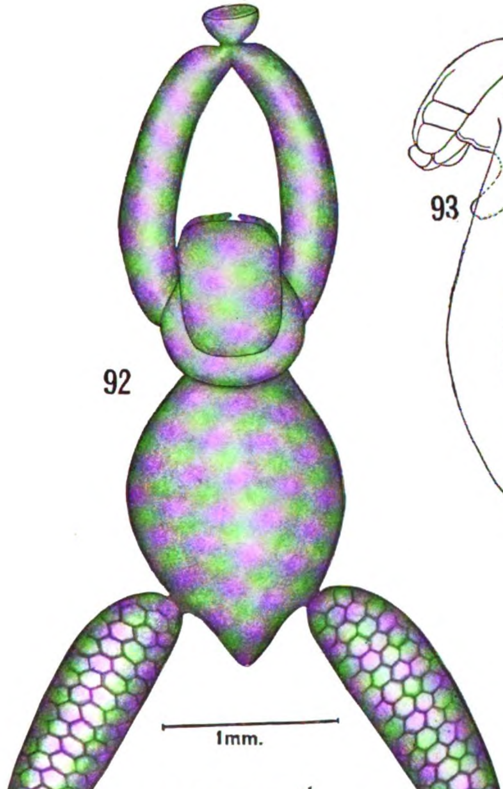
FEMALE OF ACHTHERES COREGONI AND MALE OF A. AMBLOPLITIS

FOR EXPLANATION OF PLATE SEE PAGE 722.



FEMALE OF ACHTHERES AMBLOPLITIS.

FOR EXPLANATION OF PLATE SEE PAGE 722.



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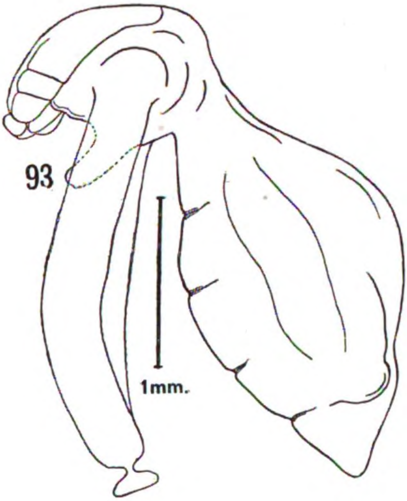

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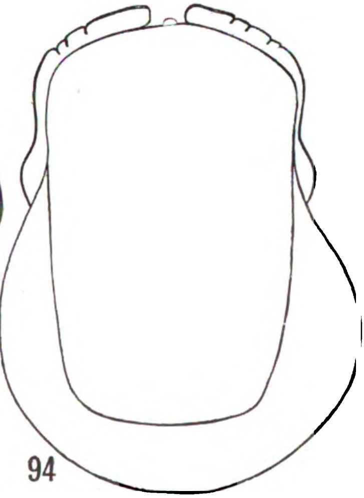

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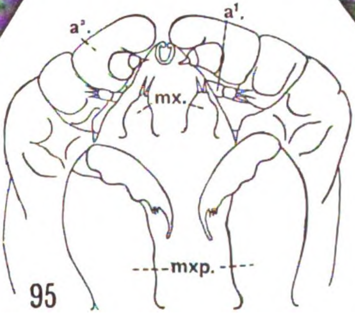

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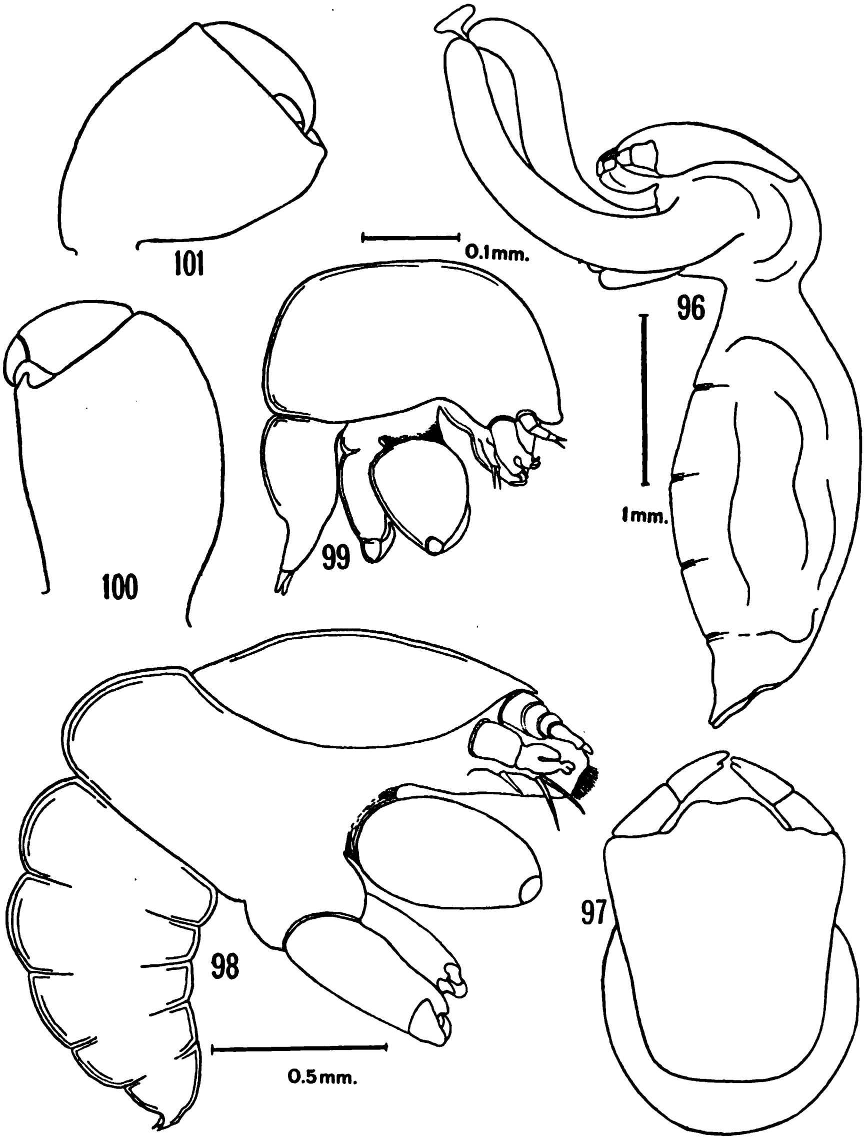
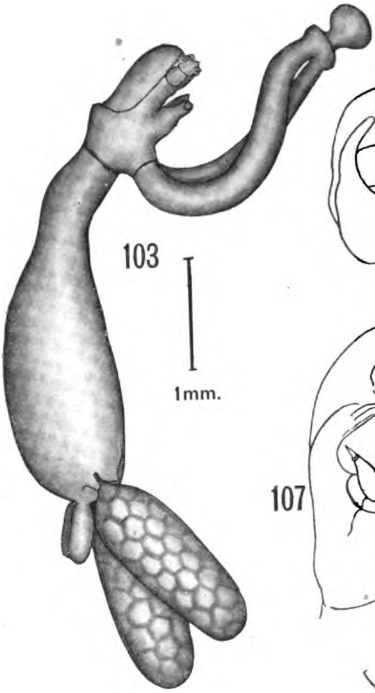
FEMALE OF ACHTHERES PIMELODI

FOR EXPLANATION OF PLATE SEE PAGE 722.



Females of Achtheres percarum and Males of Lernaeopoda elongata and Lernaeopodina relata.

For explanation of plate see page 723.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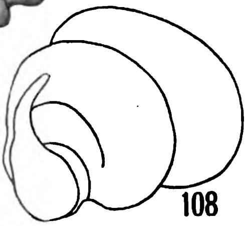
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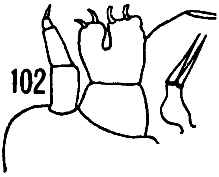
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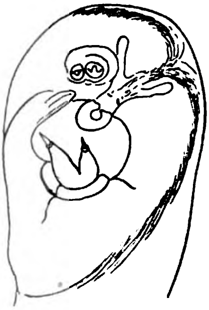
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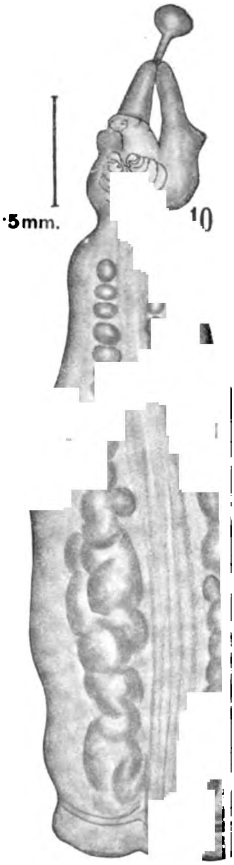
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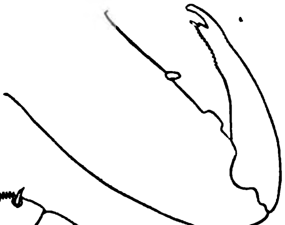
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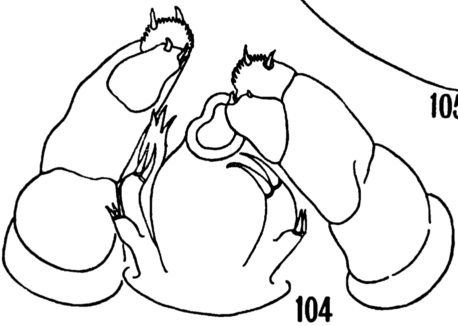
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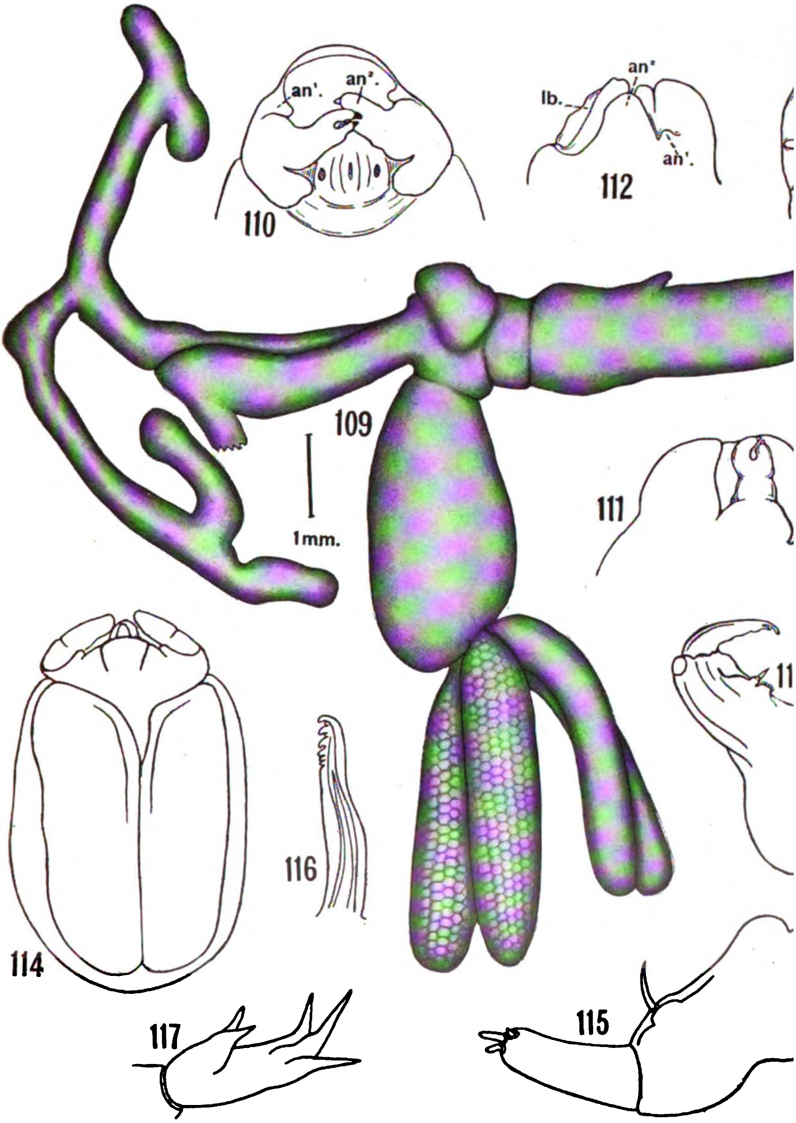
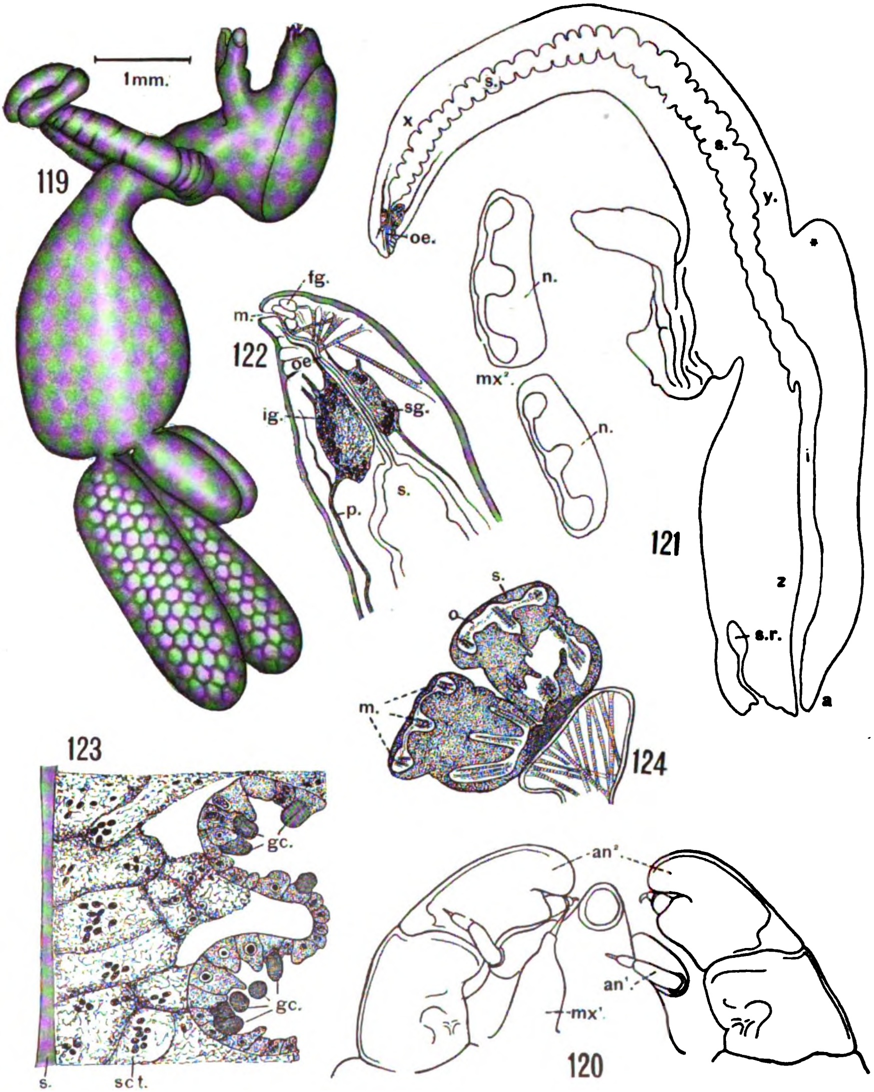
FEMALES OF LERNAEOPODINA RELATA AND TRACHELIASTES GRANDIS.

FOR EXPLANATION OF PLATE SEE PAGE 723.



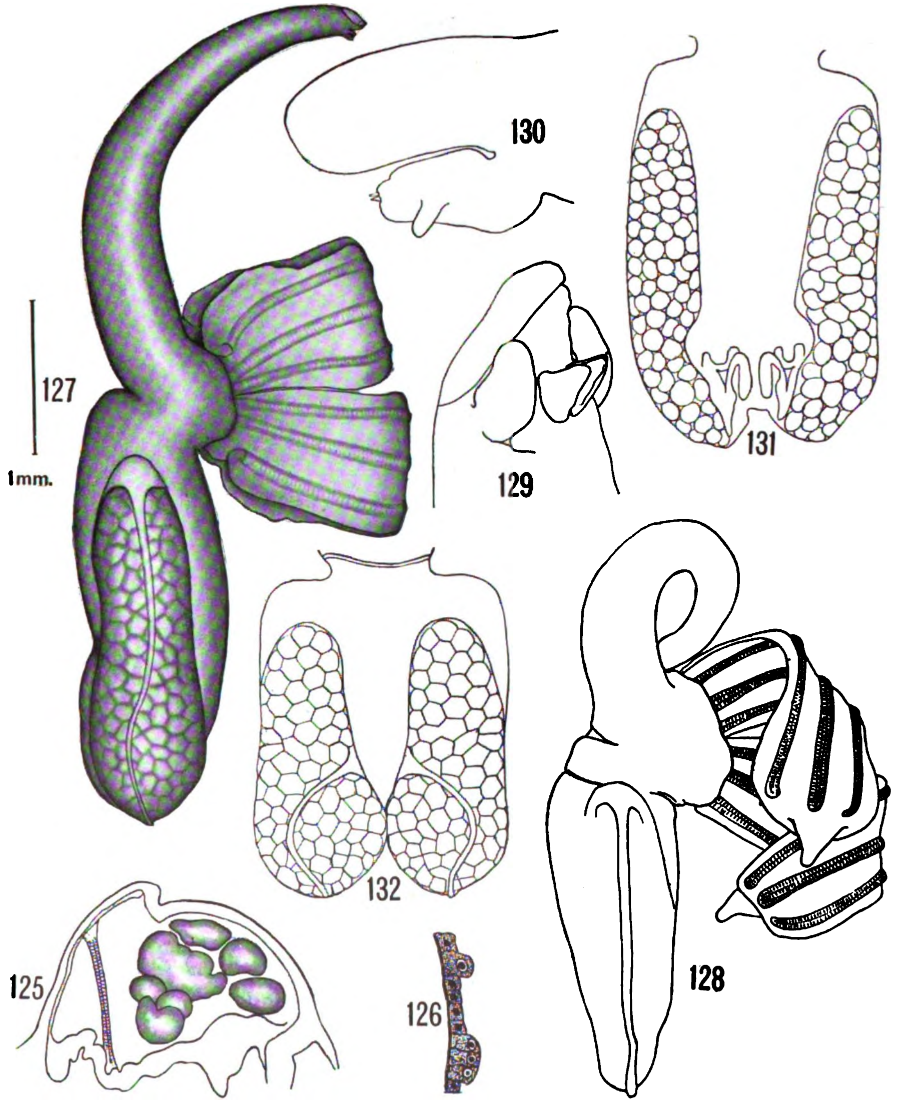
Females of Brianella corniger and Charopinus bicaudatus.

For explanation of plate see page 723.



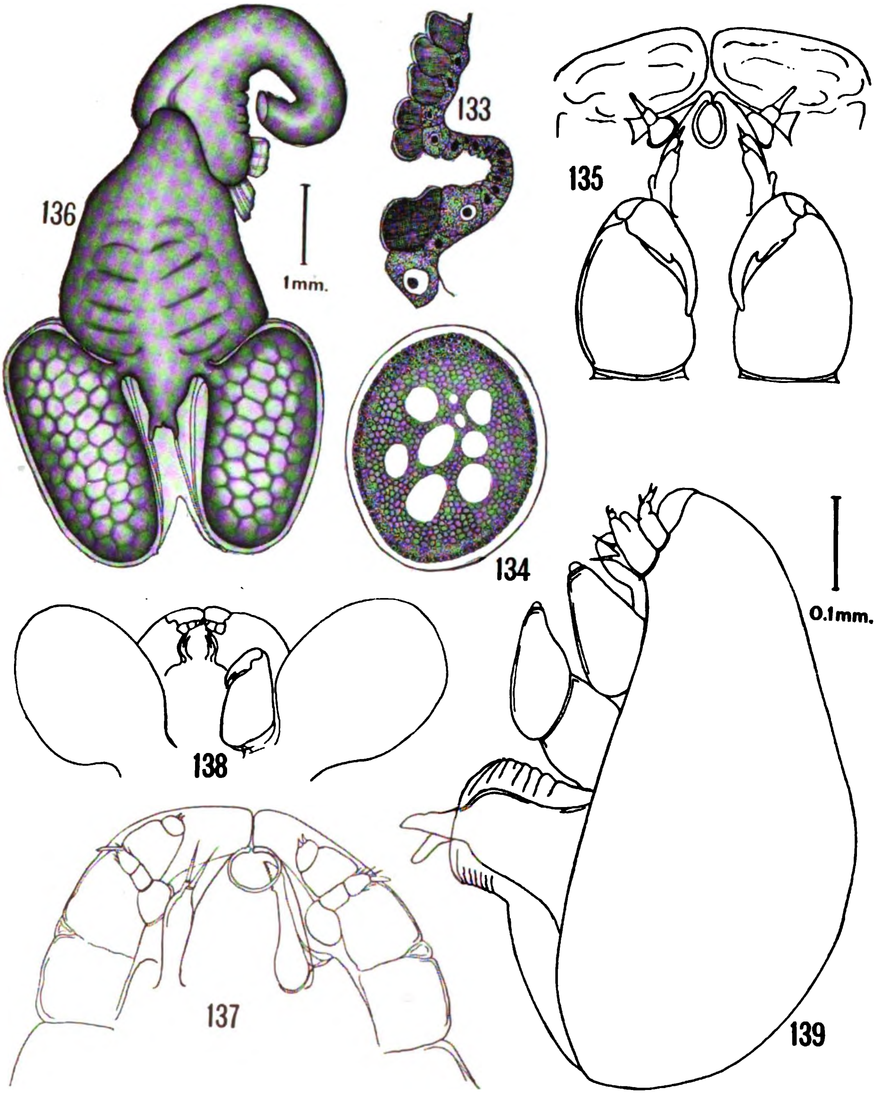
FEMALES OF CHAROPINUS BICAUDATUS AND NAOBRANCHIA LIZAE.

FOR EXPLANATION OF PLATE SEE PAGE 723.



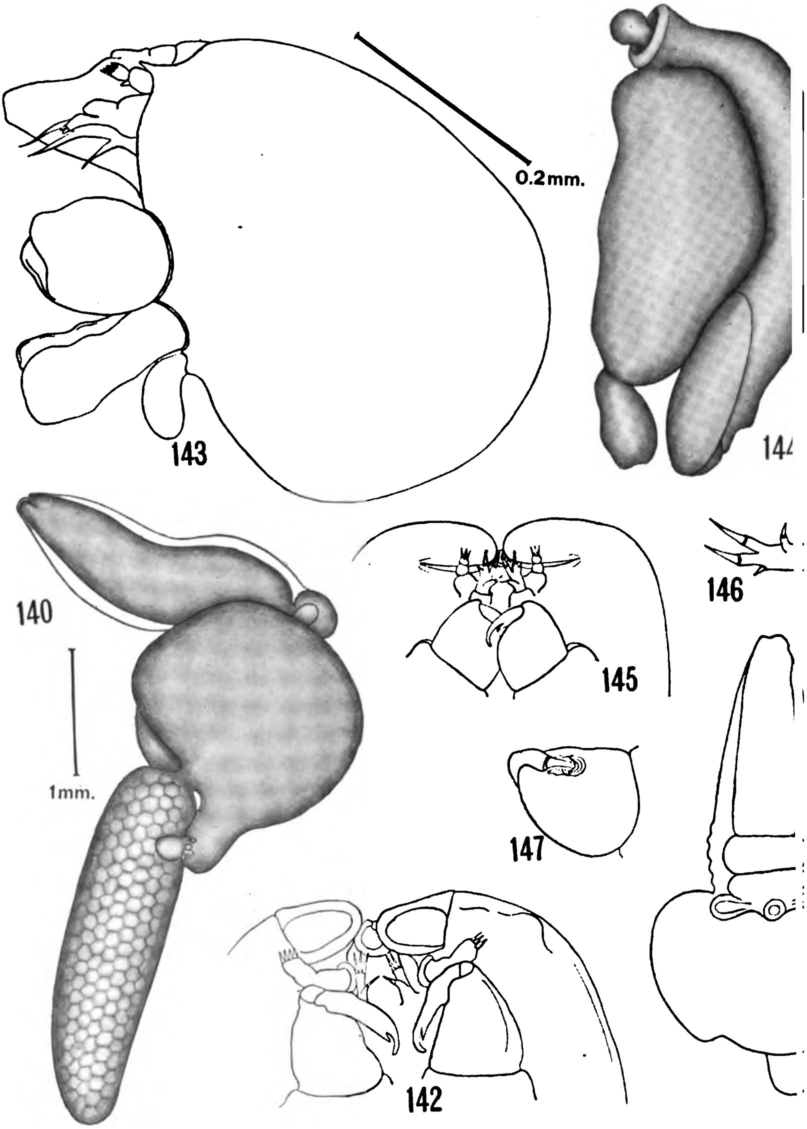
**Females of Naobranchia lizae.**

For explanation of plate see page 723.



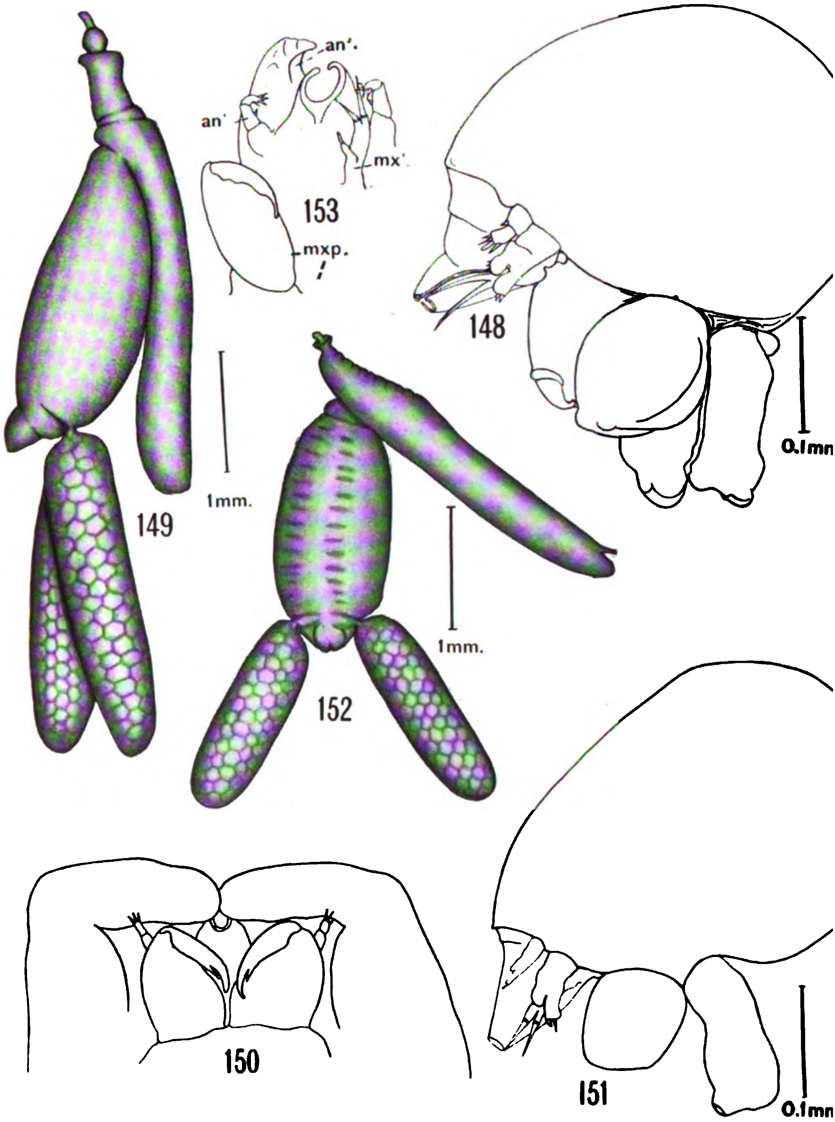
**Female and Male of Naobranchia occidentalis.**

For explanation of plate see page 723.



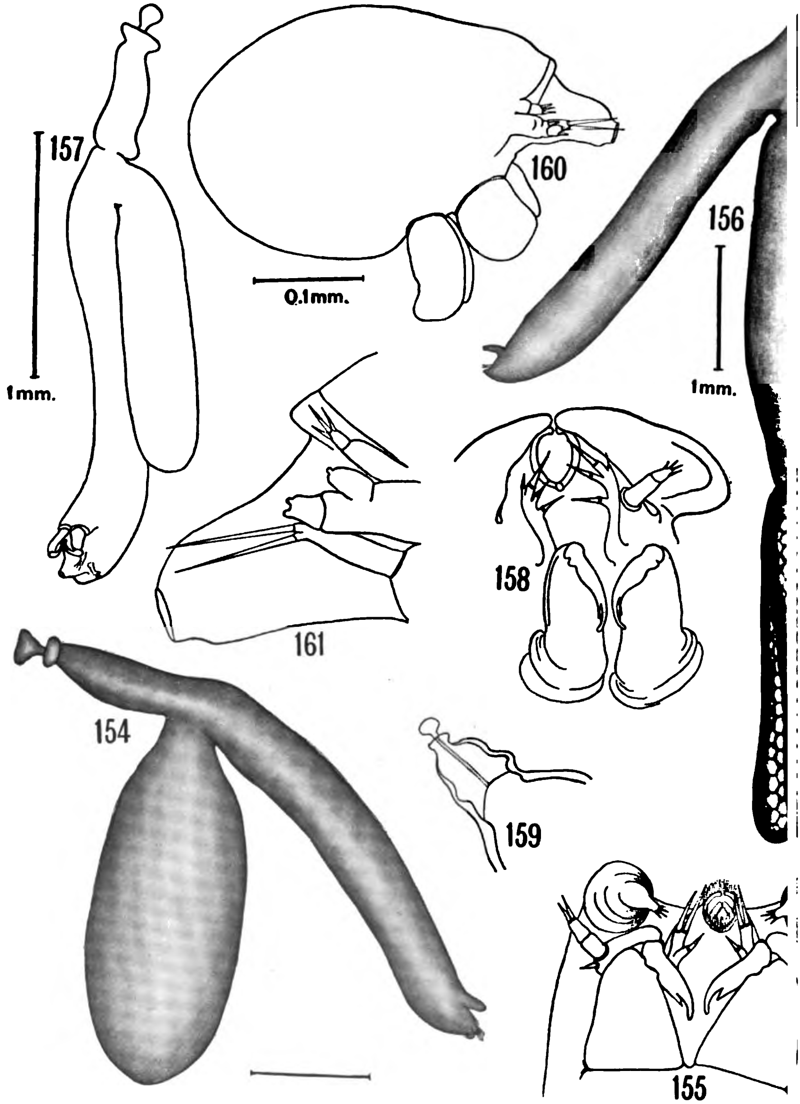
FEMALE AND MALE OF CLAVELLA PERFIDA, AND FEMALE OF C. TUMIDA.

FOR EXPLANATION OF PLATE SEE PAGE 724.



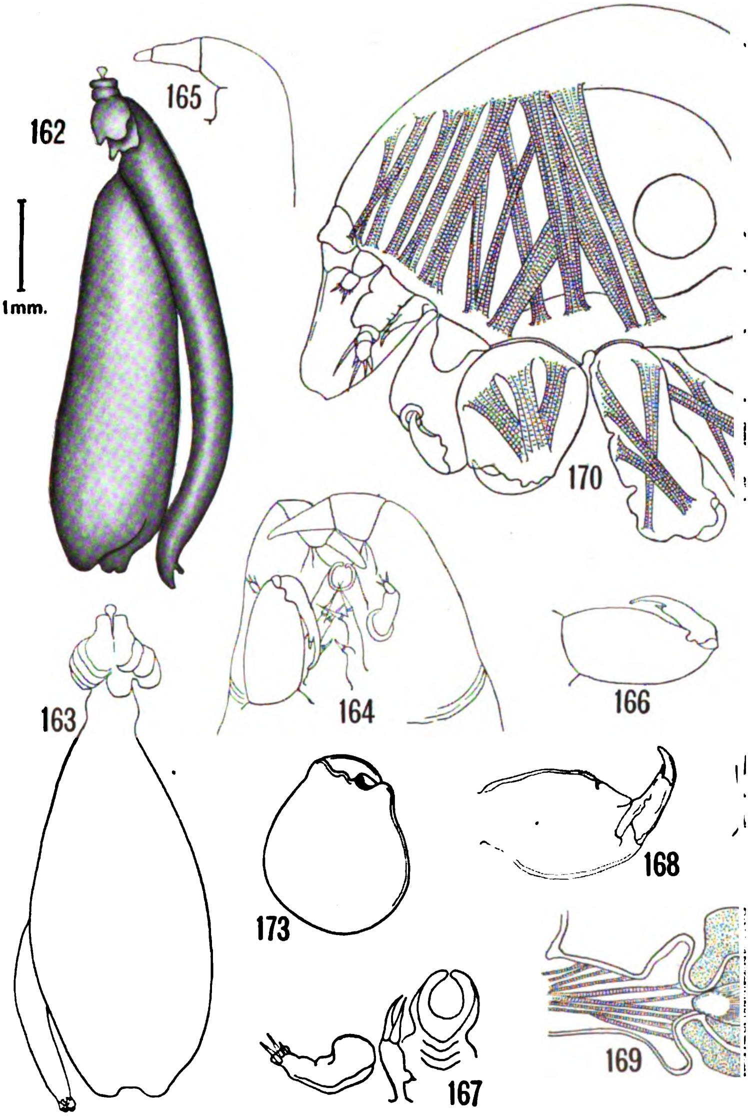
MALE OF CLAVELLA TUMIDA, FEMALE AND MALE OF C. CANALICULATA, AND FEMALE
C. INSOLITA.

FOR EXPLANATION OF PLATE SEE PAGE 724.



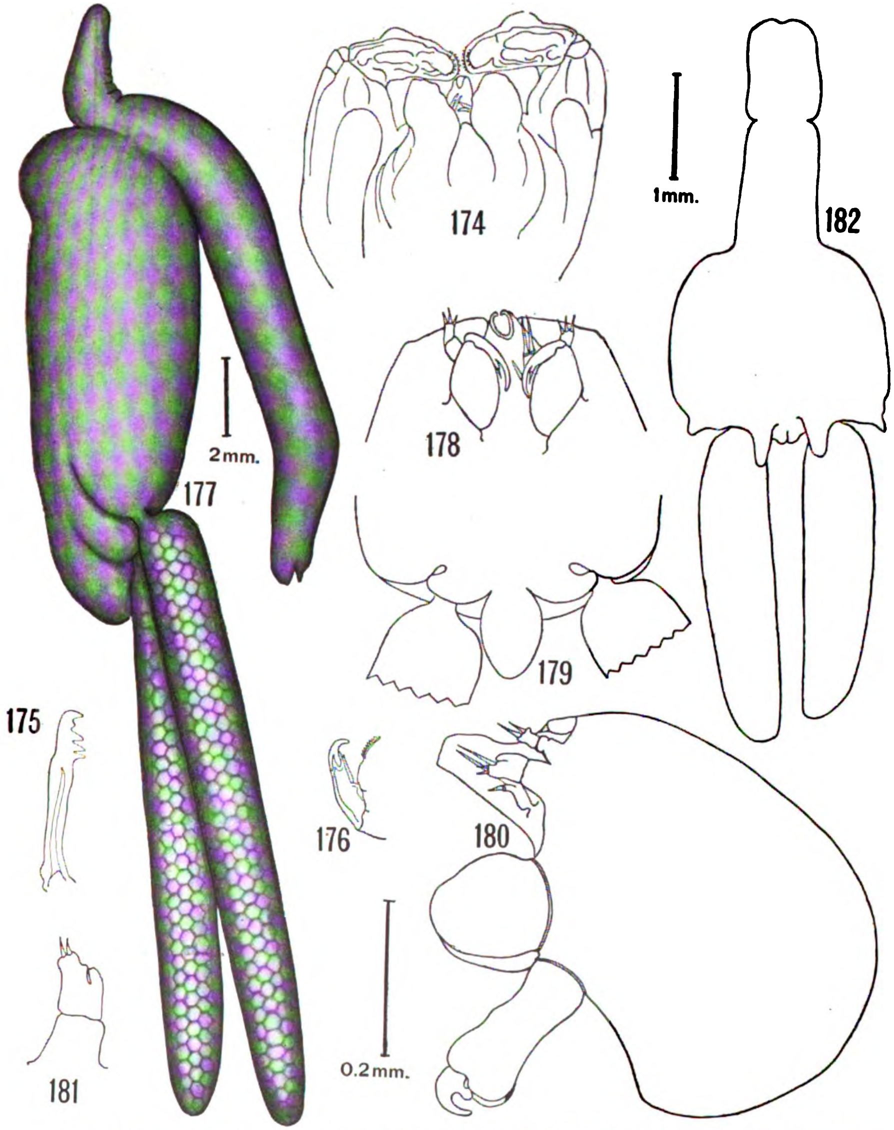
FEMALE OF CLAVELLA LEVIS, AND FEMALE AND MALE OF C. PINGUIS.

FOR EXPLANATION OF PLATE SEE PAGE 724.



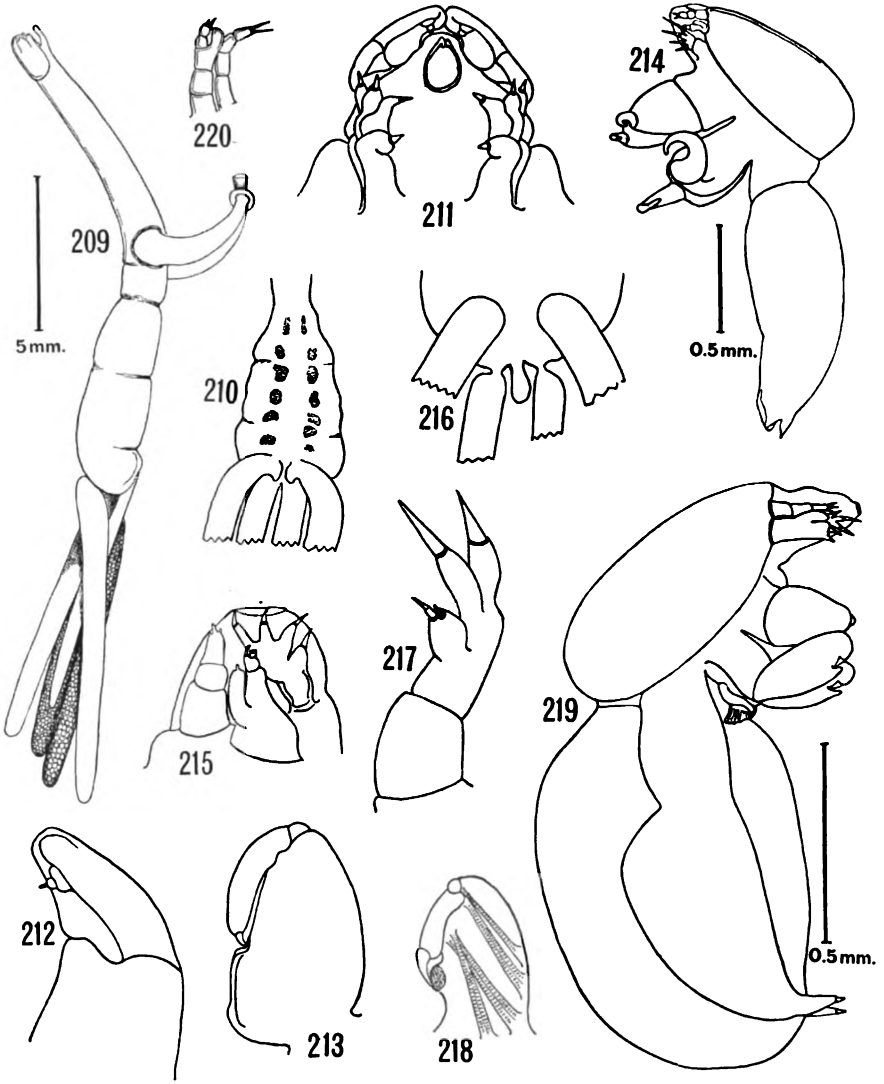
Female of Clavella squamigera, and Female and Male of C. unc

For explanation of plate see page 724.



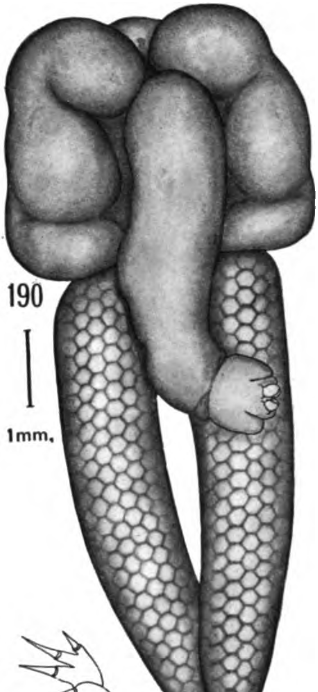
FEMALE OF CLAVELLA UNCINATA, FEMALE AND MALE OF C. IRINA, AND FEMALE OF CLAVELLOPSIS ROBUSTA.

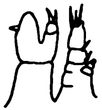
FOR EXPLANATION OF PLATE SEE PAGE 724.

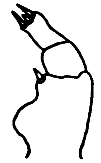


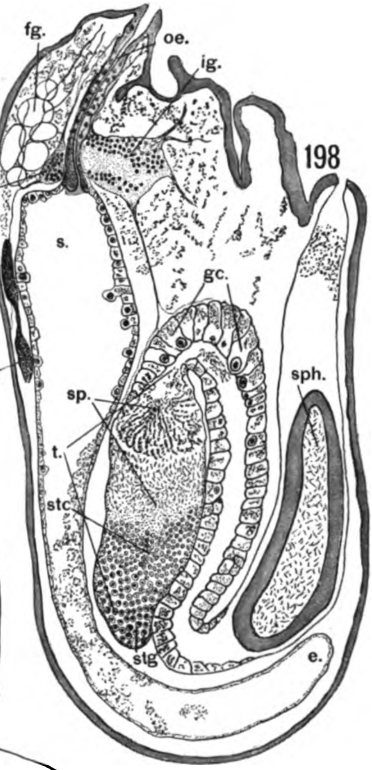
Female and Male of Brachiella thynni and B. gulosa.

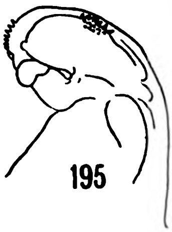
For explanation of plate see page 725.

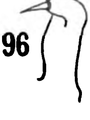


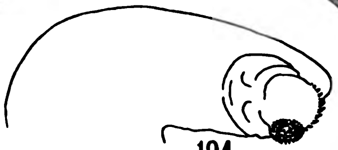


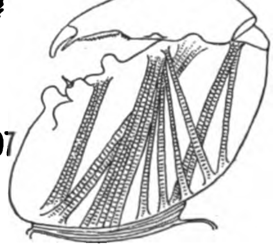


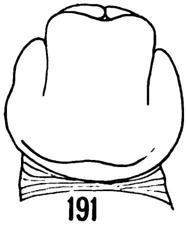


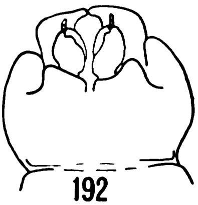












FEMALE AND MALE OF CLAVELLODES RUGOSA.

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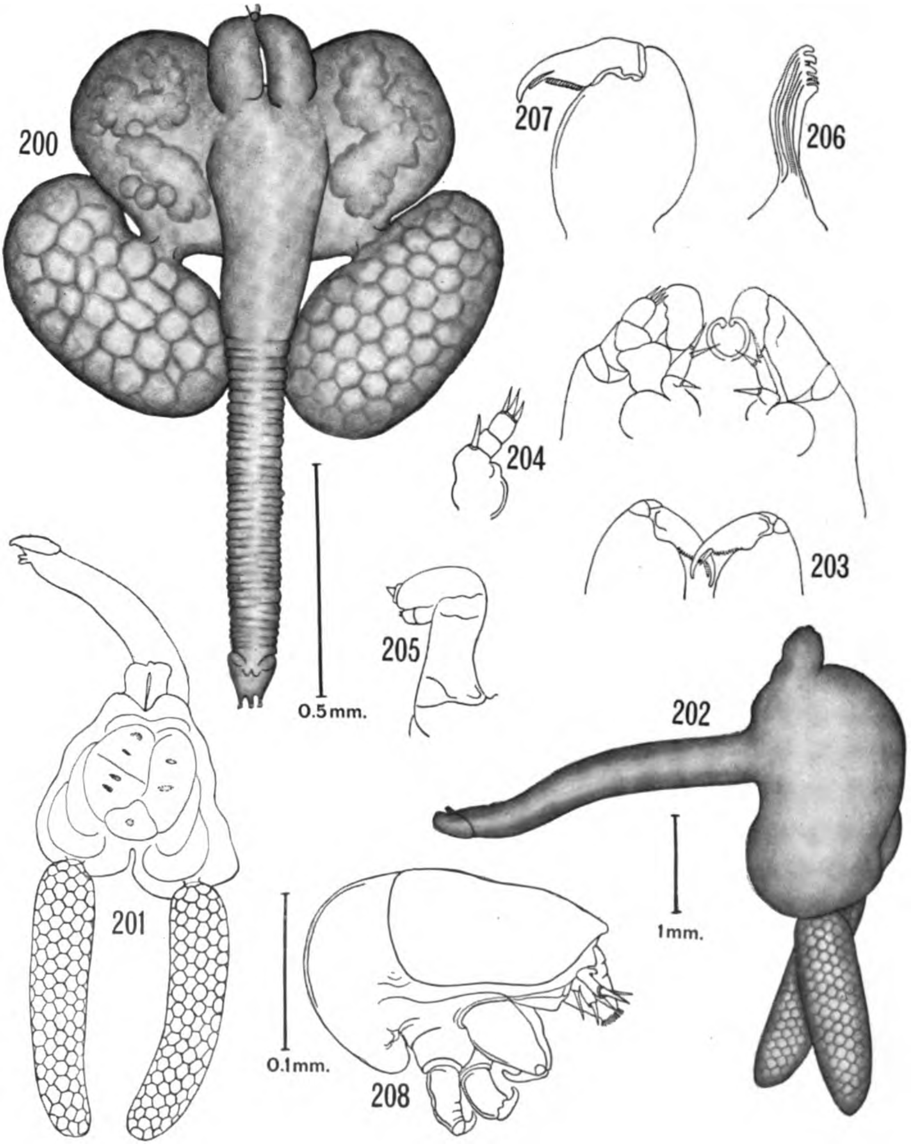

FEMALE OF CLAVELLISA SPINOSA AND FEMALE AND MALE OF C. CORDATA.

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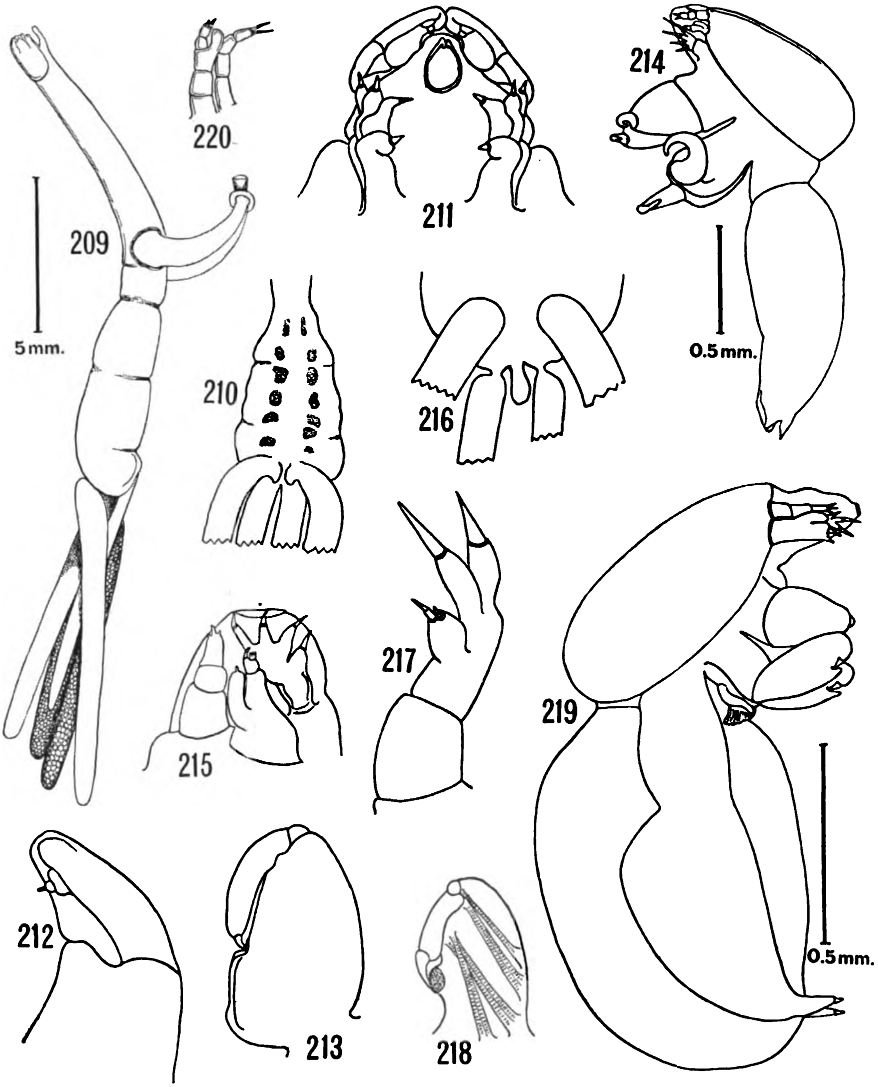

FEMALE AND MALE OF BRACHIELLA THYNNI AND B. GULOSA.

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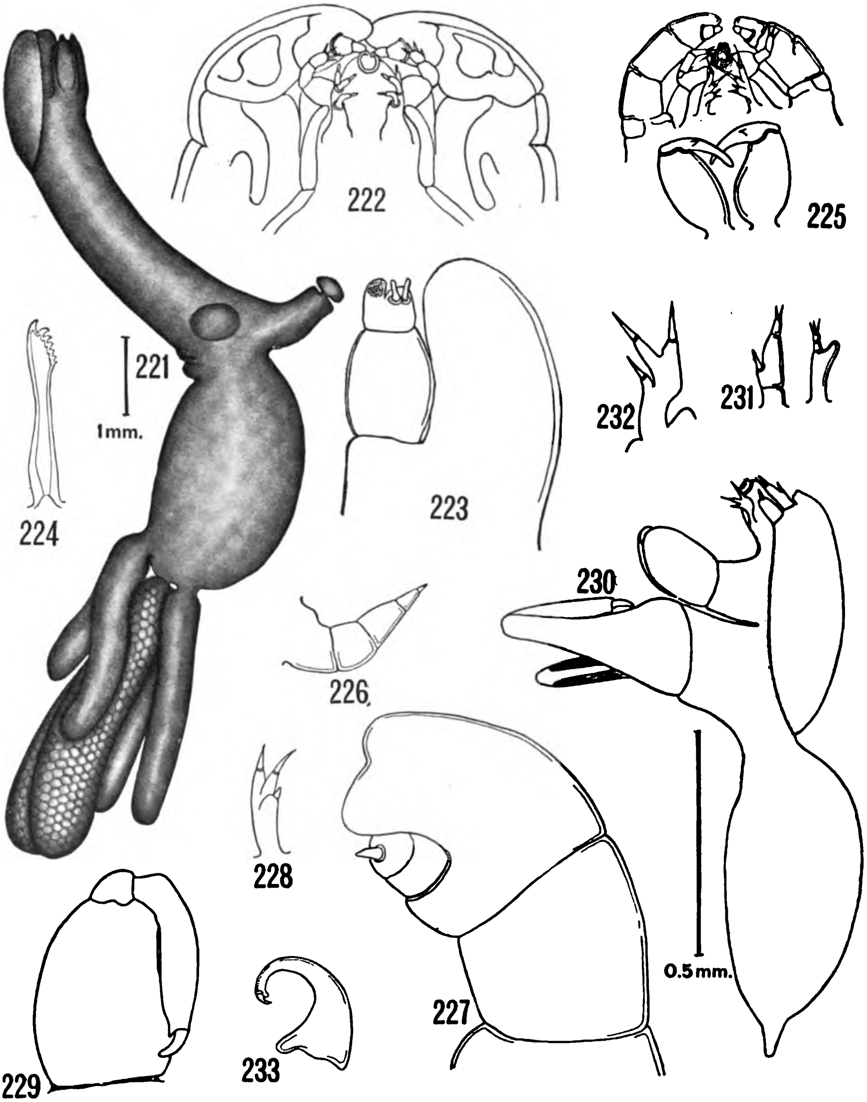

FEMALES OF BRACHIELLA GULOSA AND B. MITRATA, AND FEMALE AND MALE OF B. ELEGANS.

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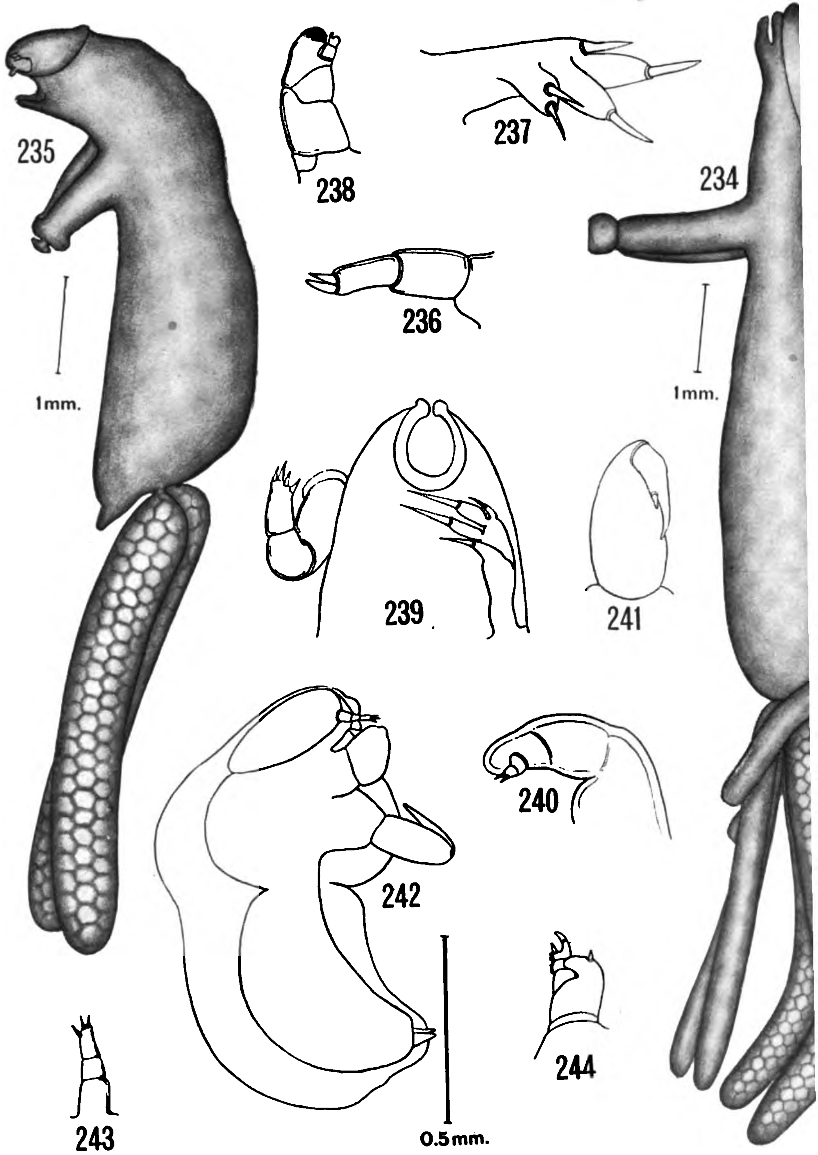

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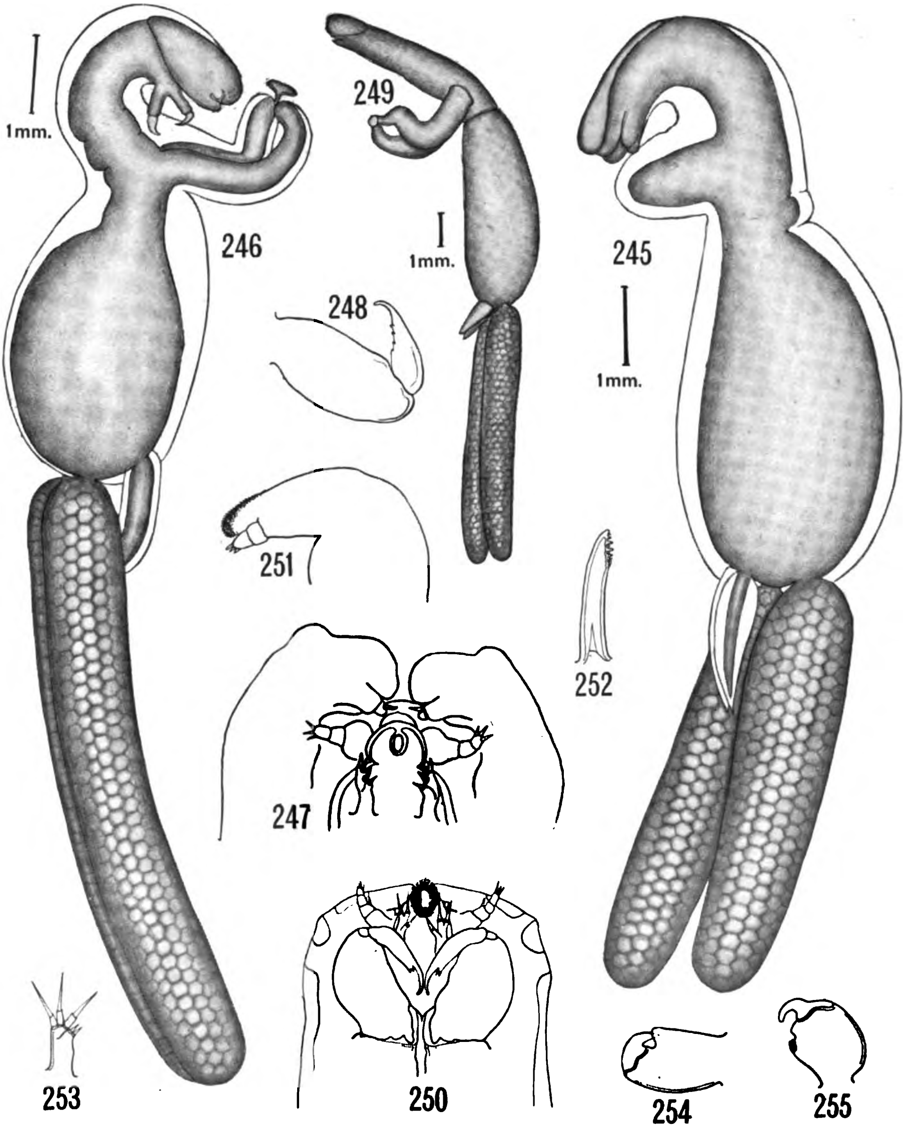

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